Vol. 39, No. 1 January, 1942

Psychological Bulletin

THE PROBLEM OF GENERAL QUANTITATIVE LAWS IN PSYCHOLOGY[1]

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The problem of general quantitative laws in psychology is a very broad, complex, and technical one. You should be relieved to know that I shall not attempt to analyze it in any systematic and exhaustive fashion. Instead, I shall endeavor to make a constructive contribution to the problem by consideration of but two matters: first, a viewpoint regarded as the one most apt to be productive of general quantitative laws; and second, by way of illustration of that viewpoint, one newly derived law which applies to a vastly greater variety of situations than do any of our present laws.

The viewpoint believed to be the most serviceable in the formulation of quantitative laws rests largely upon the nature of the primary, quantitative data of psychology. If one examines any large number of psychological investigations, he will find that the actual observations deal with the activities of organisms or the more or less immediate results of these activities. These activities are usually described in connection with the environmental circumstances under which they occur. In instances so rare today as to be almost exceptional, the activities studied are alleged internal events occurring within the experimenter and observable only by him. As a rule, however, the activities studied are those of other organisms than the experimenter and are of the sort which, presumably, anyone present could also observe. It is only in the case of this latter sort of behavior—behavior which lies, so to speak, on the surface and which might be termed surface behavior—that direct measurements, or at least moderately direct ones, are feasible. One after another, psychological systems come to the fore and

[1] Presidential address delivered at the Forty-ninth Annual Meeting of the American Psychological Association, Northwestern University, Evanston, Illinois, September 5, 1941.

then subside; but the measurements of psychology continue to be, as they have always been, measurements of attributes of behavioral responses or their products and of the environmental conditions under which these responses occur. From the fact that the primary observations of psychology are in the first instance almost entirely observations of surface behavior and its products, and from the further fact that the attributes of such behavior are measurable, it follows naturally that psychology is very largely a quantitative science.

When, from measurements of behavior or its immediate results, one argues that he has measured some unobservable conceived to exist within the individual, he is always on very unsafe ground. It is probably true that theoretically all measurements are to a degree indirect and involve some assumptions. But the indirectness of measurement does not mean that one can use his imagination freely in postulating the nature of the thing measured. The thing measured must be definable in terms of the obtained measurements; it must, in fact, be definable as a known mathematical function of the actually measured attribute. For example, it is possible to measure the time elapsing between the occurrence of a stimulus and the pressing of a key—what is known as reaction time. Now one could construct a theory postulating such a thing as will; one could then assume further that will varied as regards the quickness with which it could be mobilized for use; and one could then argue that reaction time measured the quickness with which the will got into action. But, to be sure that he had measured this agility of will, one would first have to establish the mathematical equation between that hypothetical concept and the times actually measured. Obviously, to do this would be impossible; and to attempt it could only result in inconclusive argumentation. It is by no means my intention to deny the importance of what goes on within the individual, whether these goings-on be described in physiological, conscious, or more mysterious psychic terms; nor is there any inclination to minimize the importance of knowing all that can possibly be ascertained about these internal events. It is desired simply to point out that the making of psychological measurements does not entail a penetration within the skins of our subjects, whether these be human beings or white rats; and that it should be possible, consequently, to formulate the relations existing between our measurements without making elaborate assumptions concerning the nature of

internal processes and their relations to our measured magnitudes.

Is it possible to construct a science of psychology from such measurements? Apparently a very large proportion of psychologists do not think so. Many appear to take the view that while all our measurements deal with environment and behavior, what psychologists should be most interested in is neither, but intermediate events occurring within the organism. Assumptions concerning these events seem often to be regarded as necessary for the explanation of the obtained measurements. Since it is difficult for the psychologist to observe the interior of his subjects, the sort of events which occur in the region between stimulus and response must be left largely to the imagination. And our imaginations have not failed us. The things we have stuck within the organism in the hope thereby of explaining behavior are almost without limit in number and variety. They include mental sets and cortical sets, traces, residues, synaptic resistances, inhibitory and excitatory substances, inhibitory and excitatory tendencies, determining tendencies, mental attitudes, sentiments, wishes, tensions, field forces, valences, urges, abilities, instincts, and so on and on. Very popular indeed is the animistic type of explanation. Freudian concepts, in spite of severe condemnation, are still widely used, whether in their original, crude form or disguised by a clothing of scientific and mathematical verbiage.

We tend to forget that all explanation in science must be in terms of established relationships of dependency—that is, in terms of laws; and laws, if quantitative, require measurements. Now the things referred to by the speculative constructs just mentioned obviously cannot be directly measured. In many cases, their very existence is open to question. However, it is always possible, after imagining an internal scheme of events, to postulate certain relations between these events and behavior. One may then measure the pertinent attributes of behavior and argue that he has measured some feature of the internal happening alleged to be the cause of the measured behavior. For example, we might measure an attribute termed strength, postulated to be a property of an internal entity called a food-getting drive, by measuring the frequency with which an animal crosses a grill to arrive at food which he is allowed to reach but not allowed to eat. If this were done on a number of occasions, we would obtain a number of measurements, and these might be termed indifferently measurements of the frequency of grill crossing or measurements of strength of

drive. But note that only one set of measurements would be secured. Certainly no one would, on the basis of such measurements, set up as a quantitative law the statement that the number of crossings varies in direct proportion to the strength of the drive. Such a statement would be a pure tautology, for we have used measurements of crossing frequency as though they were the same thing as measurements of strength of drive.

Even if we assumed that we had measured the strength of some motive, or other hypothetical internal event, we would still have no law, for a law takes the form $y=f(x)$ and therefore requires two sets of measurements, one pertaining to the y variable and one to the x variable. Possessing only measurements of the y variable, we would still have to inquire where are the measurements of the x variable. The x variable is that which would account for the properties of the event placed inside the subject in order to explain his behavior. Concerning the nature of the x variable we frequently encounter a profound silence. Motives or wishes are posited as primary explanatory factors, as the springs to action; but we are often left in the dark as to the causes of the springs. Before we can have a truly quantitative law, we must know and be able to measure the determining conditions of the properties of these springs. But if these determining conditions, the x variables, are measurable, they will be either environmental variables or attributes of behavior. Consequently, after all our theorizing, we shall end up with a law which merely relates behavior to environment or else relates behavior of one sort to behavior of another sort. In view of these considerations it is easy to understand why, as a matter of fact, most of the quantitative laws of psychology, derived throughout a period of over a century, refer to relations between environment and response.

The quantitative laws of psychology, then, for many years to come, may be expected to be laws relating aspects of behavior either to environmental characteristics or to other aspects of behavior. A law, however, includes a great deal more than y and x, inasmuch as it states a function in terms of certain constants or unknowns, termed parameters. Even the equation of a straight line, $y=a+bx$, contains the two parameters, a and b. Now these parameters may refer to anything whatsoever, conscious, physiological, environmental, psychic, or purely imaginary. Here one is free to follow his predilections, whether for motives, excitatory and inhibiting substances, field forces, states of disequilibrium,

inertia of the nervous system, abilities, or what not. It does not much matter, so far as quantitative laws are concerned, to what the parameters refer, since in the present state of knowledge they are seldom independently measurable. The important thing is to determine how many parameters are needed and the function of each of them. This can be done simply by mathematical analysis of the observed relations between environment and behavior. It is possible, therefore, to write the correct equations without knowing precisely what the parameters represent as regards the situation inside the subject. Even did we know with certainty precisely what they stood for, the predictive value of our equations would not be enhanced one iota unless it were possible directly, and independently of our measures of the y and x variables, to measure those parameters.

It seems, therefore, to be an entirely rational procedure to formulate the observed relations directly, on the basis of mathematical analysis. Psychological laws will, of course, always have reference to a physiological organism; but it is unnecessary for us as psychologists to specify the precise nature of the physiological functions referred to by the needed parameters. However desirable it may be, it is unnecessary to know the physiology of intelligence in order to measure it and to formulate laws concerning it, to know the physiology of memory in order to express the probability of correct recall as a function of the number of repetitions; and we need not first construct a theory of the physiological mechanism of successive comparison either to discover the falsity of Weber's law or to supply a correct formulation. There is no need first to invent weird or original things to stick inside the organism, then to make hypotheses about the properties of these imagined things, and finally to manage to interpret observational data in terms of the imagined consequences of these imagined internal entities. On the contrary, it is far safer and sounder to carry out investigations, exhaustively to analyze and summarize the data, and then to determine the extent to which the conclusions reached in a particular instance may be generalized. This procedure seems the one most likely to lead to broad generalizations because it releases us from preoccupation with the details of internal mechanisms—mechanisms which may vary enormously when considered in their totality, but which may exert identical quantitative effects upon behavior. Quantitative psychological laws so derived are, if you will, superficial laws—superficial in the sense that they state the

Ante-
inner forces

relationship between events observable from a position outside the behaving organisms. They are, nevertheless, as explanatory and as truly psychological as any laws which psychologists may hope to formulate.

The preceding discussion constitutes an outline of a viewpoint from which one may construct general psychological laws. Obviously, the value of the viewpoint can be established only by pointing to laws constructed in accordance with it. Unfortunately for the purpose of the present paper, no very broad quantitative laws have yet been established. Investigators of different situations, such as those prevailing in experiments dealing with rote memory, reaction time, discrimination, learning, and practice, have each proposed formulae that are specific for that situation. In fact, for some of these situations, notably that of learning, several different laws have been proposed. It is true that some of these laws are by no means entirely specific. For example, Courtis has succeeded in applying a law proposed by Gompertz to a wide range of cases of learning, practice, and growth. Some of Hull's laws, which are stated as laws of rote memory, could possibly be generalized so as to apply to other learning situations and perhaps to some quite different situations. Again, Weber's law has been supposed to hold over the middle range of stimulus intensities for all varieties of intensive stimuli. On the whole, however, it remains substantially true that psychology possesses no very general quantitative laws.

In view of this situation it seemed necessary, in order to demonstrate the fruitfulness of the viewpoint which has been described, to attempt to apply it in the derivation of a truly general law. Accordingly, about 20 sets of quantitative observations made by various investigators were assembled and—it must be confessed, with a good deal of doubt concerning the outcome—were subjected to various types of mathematical analysis. The study indicated at least one generalization that would hold for all of the data examined, a law conceived as expressing the relationship between attributes of performance and the environmental variables on which they depend.

The formula for this law is based on the shapes of these plotted relationships experimentally observed by numerous investigators. The study of these relationships revealed a very impressive fact, namely: no matter how favorable the status given the environmental variable, goodness of performance was limited. Man

is clearly a finite organism and never does anything infinitely well. As the environment is made more favorable he improves, yes, but the more he improves the more obvious it becomes that, no matter what degree of favorableness be imposed upon the environmental conditions, there is a limit in goodness of performance that can never be exceeded. Now there are various ways of stating this truth in mathematical language. The expression chosen is that which, of all simple ones, seems to agree best with the existing data. It consists of the product of what may be conceived to be an upper limit, termed k, and a function which increases with increase in the environmental variable, namely: $1-f^x$, in which f is a positive fraction less than unity. If this were the whole story, we could write an equation stating that y, the measured attribute of performance, equals $k(1-f^x)$. This law, expressed graphically, would take the form of a curve which is negatively accelerated throughout and approaches an upper limit asymptotically—that is, a form roughly resembling the upper part of the letter S.

It is obvious, however, that a second factor must be taken into account, one whose influence is greatest when the magnitude of the environmental variable is very small. In numerous cases the lower part of the curve relating goodness of performance to the environmental variable resembles the lower part of the letter S. To account for the shape of the lower part of the curve, a factor designated by the letter p was assumed, and the magnitude of response considered to be the square root of the sum of the square of this factor and the square of the factor already mentioned. The parameter p is considered to represent merely a potentiality for response, since, in the complete absence of the environmental variable, the equation would become $y=p$, but there would be no actual performance.

Nothing is known or assumed concerning the physiological factors or complex of factors which determine the values of the parameters: p, the potentiality for response; k, the upper limit; and f, the fraction which determines how rapidly the limit is approached with increase in the environmental variable. In all probability the physiological factors determining the values of these parameters are not only complex but vary greatly with the type of behavior and the environmental variable.

Lastly, allowance must be made for the fact that either behavior or environment, or both, may be measured by scales with an arbitrary zero. To allow for this arbitrariness of zero points, it

is necessary to introduce two additional parameters, one represented by the letter a, to control the origin of the y scale, and another designated d, to correct the zero point of the x scale. The way in which all these parameters were combined is indicated by the equation which appears in Figure 1.

The law thus arrived at appears to have a truly amazing degree of generality. Apparently it holds in the case of all learning and practice curves, either with human beings or with white rats, provided the curves adequately show the increase in accomplishment with increase in number of trials or amount of time. It agrees with data from experiments on memory—for example, those showing the increase in number of nonsense syllables correctly anticipated with increase in number of trials, and also those bearing on the course of forgetting. It fits various sets of data dealing with reaction time. It gives correctly the relations which Weber's law describes incorrectly. It applies to pitch discrimination as well as to intensity discrimination. It agrees with certain formulations of the increase in intelligence with increase in age. How well it does all this, you will be able to judge from the graphs which follow.

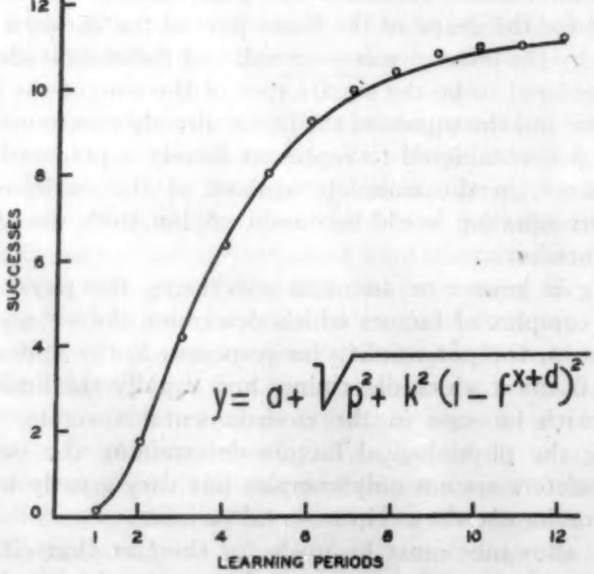

Fig. 1. Learning in Generalized Abstraction
(Data from Hull (2). $p = 15.236$; $k = 21.548$; $f = .6635$; $a = -15.07$; $d = -1$.)

The formula, as indicated in Figure 1, is y equals a plus the square root of the sum of two squared magnitudes. The first of these squared magnitudes is p, and the second is the product of k into $1-f$, with f raised to the power $x+d$. It could be written in several slightly different mathematical notations,[2] and in certain conceivable cases it might be simplified, particularly if an approximation formula would suffice. In all of the figures the continuous curve represents the theoretical values calculated from the formula (by methods of successive approximations), and the small circles represent the original unsmoothed values reported by the investigator. The observed (y) and calculated ($\bar{y}$) values for each curve are listed in Appendix I.

Figure 1 shows data obtained by Hull (2) in a learning experiment. The learning involved abstraction and generalization, in that the subjects were required to identify and name the characteristic common to groups of Chinese characters. The scores, or y values, indicate correctness of response for successive 12-minute learning periods.[3] As may readily be seen, the agreement between the two sets of values, the calculated and the observed, is an excellent one.

The next two curves, those in Figures 2 and 3, are maze learn-

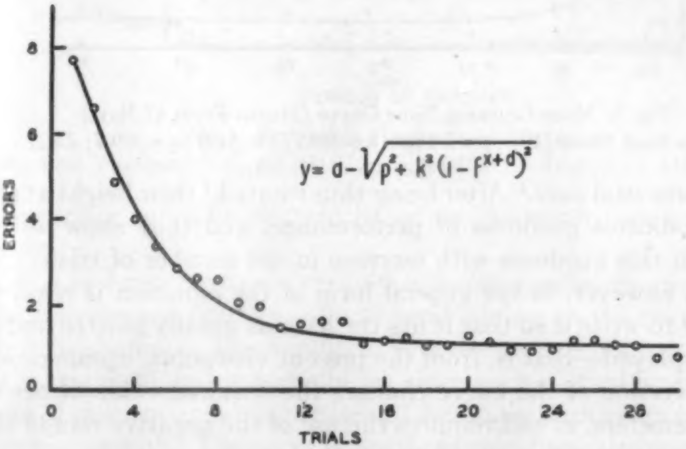

Fig. 2. Maze Learning Error Curve (Means From 47 Rats)
(Data from Stone (10). $p = 10.3063$; $k = 14.5753$; $f = .7418$; $a = 18.90$; $d = .2$.)

[2] For example, in place of $k^2(1-f^{x+d})^2$, one could write $k^2(1-e^{-c(x+d)})^2$, in which e stands for the natural logarithmic base.

[3] In the case of one representative subject, Cha.

ing curves based on data obtained by Stone (10). The first of these is an error curve, and the second a time curve. They represent the mean scores made on a multiple-T maze by a group of 47 rats.[4] Like most time and error curves they are conventionally plotted so that the score *decreases* with increase in the environmental variable, number of trials. Since the law here under consideration implies that the measured attribute of performance *increases* with increase in the favorableness of the environment, these curves are inverted before they are fitted—that is, they are rotated 180° on

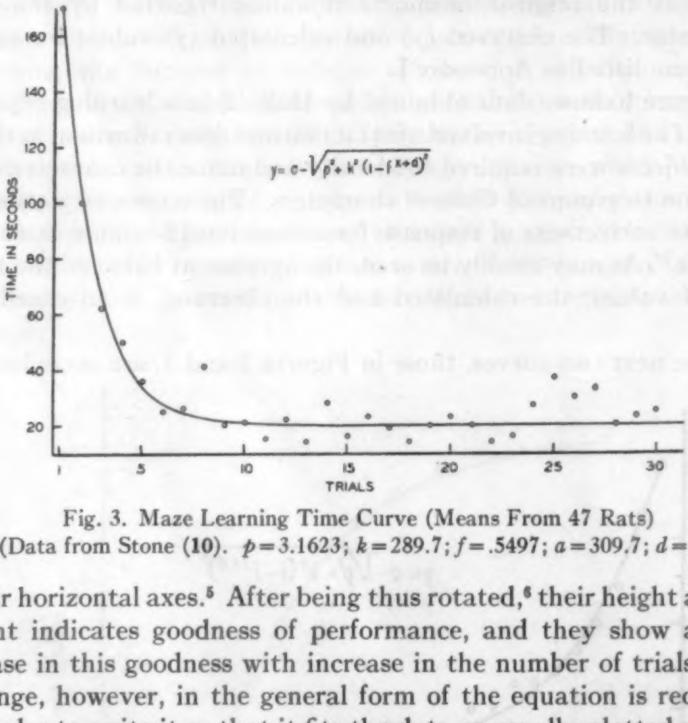

Fig. 3. Maze Learning Time Curve (Means From 47 Rats) (Data from Stone (10). $p=3.1623$; $k=289.7$; $f=.5497$; $a=309.7$; $d=.1$.)

their horizontal axes.[5] After being thus rotated,[6] their height at any point indicates goodness of performance, and they show an increase in this goodness with increase in the number of trials. No change, however, in the general form of the equation is required in order to write it so that it fits the data as usually plotted and as here displayed—that is, from the present viewpoint, upside down. This inversion of the curve changes the required value of one of the parameters, a, and requires the use of the negative root of the expression under the square root sign.

[4] The group varying in age from 31 to 60 days.

[5] By subtracting each y value from the value for the first trial.

[6] The curves should be considered in this rotated position in estimating the plausibility of the calculated values of the parameters, particularly the parameter p.

Figure 3 shows time measurements made on exactly the same performances as those represented by the error measurements shown in Figure 2. The performances are the same, but the measured attribute has changed from correctness to time. Likewise, the shape of the curve and the values of the parameters have changed. It may be mentioned that the formula here used has also been fitted to several other maze learning curves, including a well-

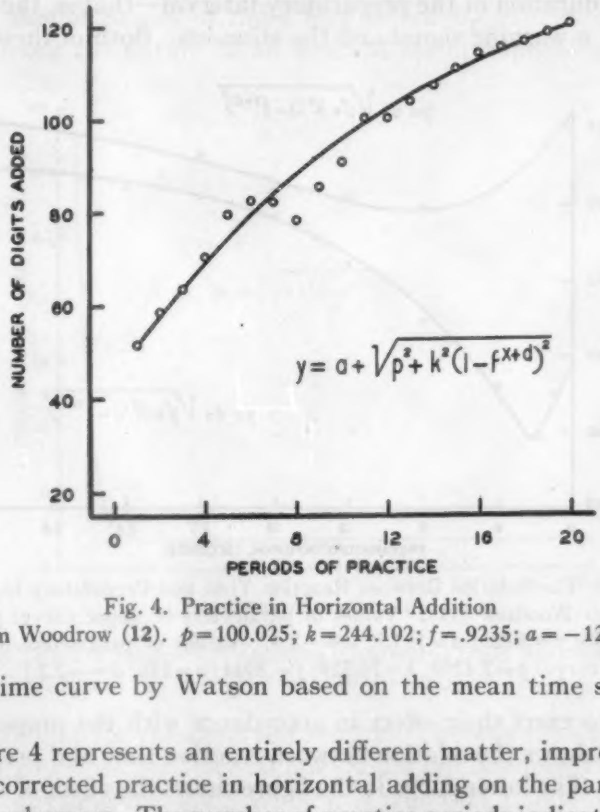

Fig. 4. Practice in Horizontal Addition
(Data from Woodrow (12). $p = 100.025$; $k = 244.102$; $f = .9235$; $a = -123$; $d = 10$.)

known time curve by Watson based on the mean time scores of 19 rats.

Figure 4 represents an entirely different matter, improvement with uncorrected practice in horizontal adding on the part of one college sophomore. The number of practice periods indicated along the x axis is 20, but was really 60, since each plotted score is the mean of three periods of practice of 10 minutes each given on three consecutive days. The curve is a rather typical practice curve, and any one of literally hundreds of such curves which are available could equally well have been used. It should be pointed out, however, that a curve such as this, considered alone, does not afford a very satisfactory test of the formula, for the reason that it represents only the latter portion of the subject's total learning. Ac-

cording to the curve here fitted to the data, pre-experimental practice or its equivalent was equal to 10 units on the base line—that is, to 30 ten-minute periods of practice.

Any general law relating performance to environment should certainly have application in the field of reaction time. There are at least two environmental variables which have been established as causative factors of reaction time: the intensity of the stimulus and the duration of the preparatory interval—that is, the interval between a warning signal and the stimulus. Both of these factors

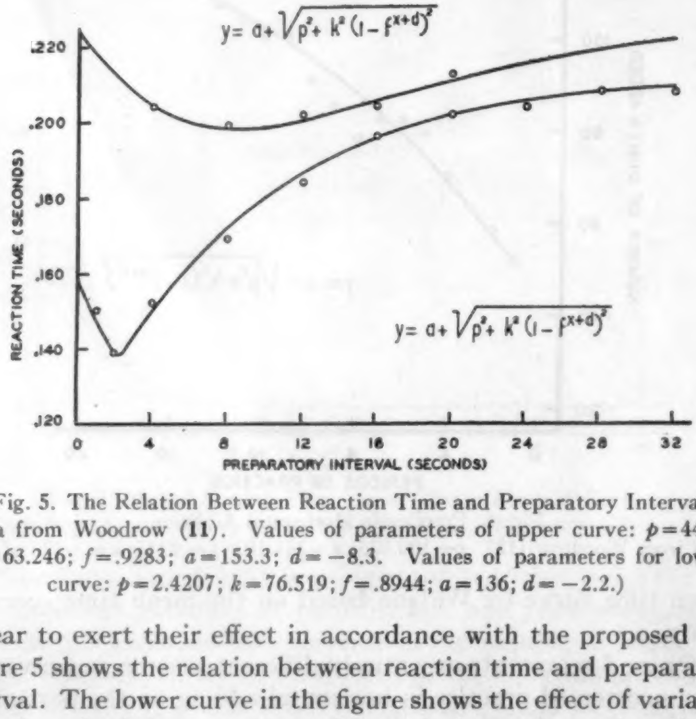

Fig. 5. The Relation Between Reaction Time and Preparatory Interval (Data from Woodrow (11). Values of parameters of upper curve: $p=44.721$; $k=63.246$; $f=.9283$; $a=153.3$; $d=-8.3$. Values of parameters for lower curve: $p=2.4207$; $k=76.519$; $f=.8944$; $a=136$; $d=-2.2$.)

appear to exert their effect in accordance with the proposed law. Figure 5 shows the relation between reaction time and preparatory interval. The lower curve in the figure shows the effect of variation in the length of the preparatory interval when only one length was used at a sitting, with the subject aware that the interval would remain the same. The curve indicates that for this subject, under the prevailing conditions, the most favorable preparatory interval was 2.2 seconds. The upper curve shows the results when different preparatory intervals, varying in length from 4 to 24 seconds, were mixed irregularly so that the subject never knew what length of interval to expect. Under these conditions, the most favorable duration of the preparatory interval was about 8.3 seconds. In

both cases the fit of the theoretical curve to the observed times is excellent.

It is an interesting fact that these same data, as well as those shown in Figure 6, have been fitted by Landahl (4) by means of curves derived from certain biophysical hypotheses concerning an assumed physiological mechanism leading to the overt response. There can be little doubt that it is theoretically possible to derive a curve similar to any of those here shown by imagining in sufficient detail the nature of an internal set of happenings which

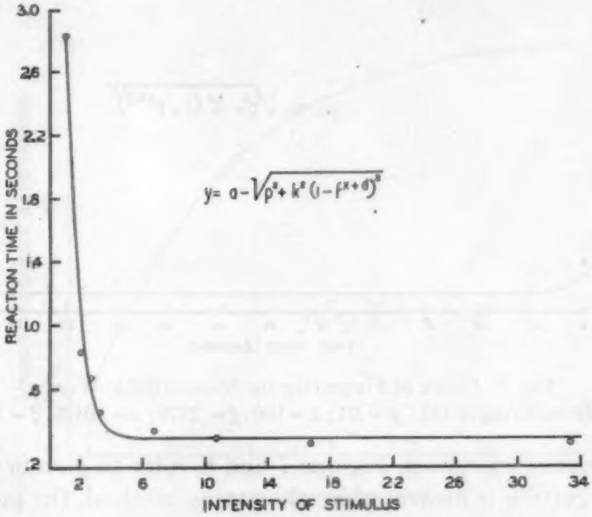

Fig. 6. Effect of Intensity of Stimulus (Gustatory) Upon Reaction Time (Data from Piéron (7). $p = .01$; $k = 12.450$; $f = .2621$; $a = 12.731$; $d = .167$.)

would account for the observed results. There is thus no reason why any psychoenvironmental law should not be supplemented by a psychophysiological law. While it is true that Landahl's curves and those here shown are not identical, they closely resemble each other in shape and in the number of parameters employed, so that the two sets of curves taken together may be regarded as representing an approach, at least, to the supplementation of the laws of what I have termed surface psychology by laws referring primarily to physiological events.

Several sets of data concerning the relation between reaction time and intensity of stimulus have been fitted. The curve here shown pictures the relation between reaction time and the concen-

tration of a sugar solution, as determined by Piéron (7), in the case of a single subject. As in most of this investigator's extensive work on reaction time, the number of reactions obtained with any one intensity of stimulus was quite small. It is perhaps for this reason that he largely ignored both the effect of practice and the variation in reaction time from sitting to sitting, both of which have by other investigators been found to be rather pronounced. It is a tribute to his carefulness in controlling conditions that, with such a small number of reactions measured at each intensity, the results follow so closely any relatively simple mathematical curve.

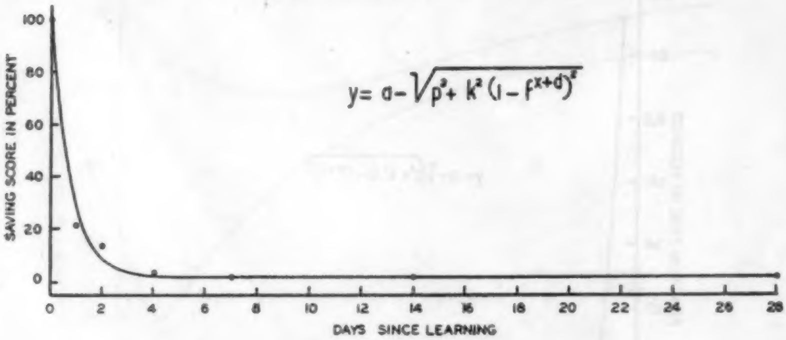

Fig. 7. Curve of Forgetting for Monosyllabic Words
(Data from Krueger (3). $p = .01$; $k = 100$; $f = .2679$; $a = 101.5$; $d = .01147$.)

The next two curves, Figures 7 and 8, refer to memory. Since, when forgetting is measured by the saving method, the percentage of repetitions saved decreases with time, it is necessary, as in the case of maze learning, to imagine the curve inverted. We thus get a curve showing the increase in forgetting with increase in time. Then, if we wish, we may write the formula so that it fits the curve as usually plotted. Figure 7 shows that our formula well indicates the course of forgetting in the case of monosyllabic words, as determined by Krueger (3), by means of the saving method used in connection with the usual anticipatory method of verbal recall. The case pictured is that in which the original learning of the lists was 100% correct, with no overlearning.

Figure 8 shows the course of learning in memorizing paired associates, each pair consisting of a two-digit number and a letter. Immediately after each exposition of a series, the pupils were asked to write the proper letters alongside a furnished list of numbers. The published data were obtained by averaging the results for the

members of a fifth-grade class. The x values represent the successive trials, and the y values the average number of correct associations. Moore (5), who conducted this experiment, also made a penetrating mathematical analysis of the data and compared the closeness of fit of two theoretical formulae. The better of these, the Gompertz-Courtis formula, he found to give a very satisfactory fit. The present formula, however, gives a considerably better one.

Probably the most crucial test of such a general law as that being here considered is afforded by the data on sensory discrimina-

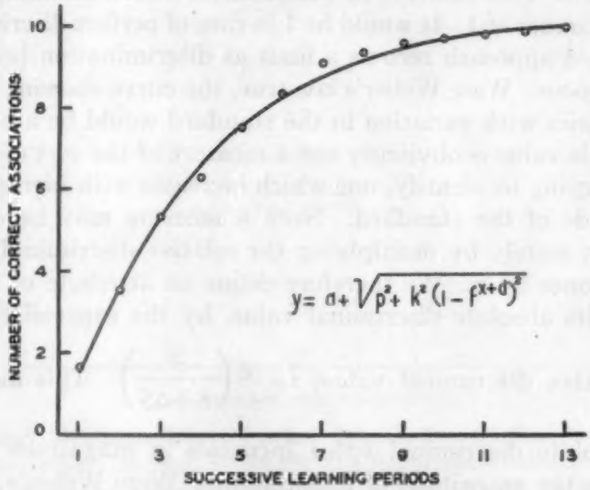

Fig. 8. Learning Curve for Paired Associates (Numbers and Letters) (Data from Moore (5). $p = 8.963$; $k = 20.042$; $f = .73153$; $a = -11.7$; $d = 1.1$.)

tion designed to test Weber's law. Weber's law deals with two values: first, the magnitude of a standard, designated S; and second, a magnitude, expressed in the same physical units as the standard, called the just noticeable difference, designated ΔS. There appears to be no response which increases in magnitude with increase in the standard, and yet it is only to such a response that the law here considered could apply. The just noticeable difference, or ΔS, is not such a magnitude, for it is merely a difference between two physical stimuli, namely: the standard stimulus and a stimulus just noticeably different from the standard. Of course, one might drag in the concept of intensity of sensation and consider the sensation to be the response which increases with increase

in the magnitude of the stimulus. Such a procedure, however, would be a departure from the principles here advocated and, further, would lead only to confusion. The difficulty lies in the failure sufficiently to analyze the nature of the measures obtained in a Weber's law experiment. In the first place, it is clear that from such an experiment, at each value given the standard, we obtain a measure of what may be termed the relative discriminal value of the subject's response to the standard. The measure of this relative discriminal value of the response is the relation of the standard to the just noticeably different stimulus—that is, $S/(S+\Delta S)$. This value, $S/(S+\Delta S)$, varies from a minimum of zero to a maximum of 1. It would be 1 in case of perfect discrimination and would approach zero as a limit as discrimination became extremely poor. Were Weber's law true, the curve showing how this value varies with variation in the standard would be a horizontal line. This value is obviously not a measure of the sort of response we are trying to identify, one which increases with increase in the magnitude of the standard. Such a measure may be obtained, however, merely by multiplying the relative discriminal value of the response by S. We therefore define an attribute of response, termed its absolute discriminal value, by the expression S times the relative discriminal value, *i.e.* $S\left(\frac{S}{S+\Delta S}\right)$. This measure of the absolute discriminal value increases in magnitude with increase in the magnitude of the stimulus. Were Weber's law true, the plot of this value against S would be a straight line rising proportionally to the increase in S. It is this magnitude which has been used as the y value in fitting our formula to data bearing on Weber's law. One may, of course, from the formula for the absolute discriminal value, readily calculate[7] the more familiar values, ΔS and $S/(S+\Delta S)$. For graphic representation these latter measures are more revealing than the y values from which they are derived and are the ones plotted in the figures here shown (Figs. 9, 10, 11, 12, and 13).

The continuous curve in Figure 9 shows the course of the relative discriminal value of the response, measured by $S/(S+\Delta S)$, as derived from the absolute discriminal values calculated by the

[7] From the following formulae: $\frac{S}{S+\Delta S}=\frac{y}{S}$; $\Delta S=\left(\frac{S^2}{y}\right)-S$.

formula. On account of the vast range of the x values, it is necessary to plot them logarithmically. Otherwise, the distance between the two values at the extreme right of the curve would have to be no less than 500,000 times the distance between the first two values at the left. This condensation of the curve tends to conceal the excellence of the agreement between calculated and observed values over the upper 99.5% of the entire range of x values. Since the height of the curve over any point on the x axis represents the goodness of relative discrimination, the curve shows well the in-

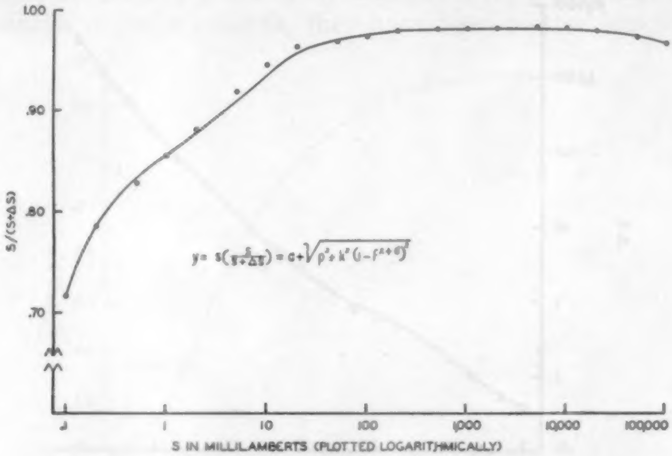

Fig. 9. Brightness Discrimination: Relation Between Relative Discriminal Goodness, S/(S+ΔS), and Brightness of Standard (Data from König and Brodhun (**6**). $p=2.66$; $k=3{,}446{,}884$; $f=.999999715$; $a=-5.2843$; $d=4.6321$. The values of S/(S+ΔS) are calculated from y by the formula, S/(S+ΔS) $=y/$S.)

crease in goodness of discrimination at low x values, with increase in the brightness of the stimulus. When the standard reaches a magnitude in the neighborhood of 10,000 millilamberts, a decrease in relative discriminal goodness sets in. Any law which ignored this decline in relative discriminal goodness at high stimulus magnitudes, as do both Weber's law and all the proposed substitutes therefor, would be systematically in error throughout no less than 90% of the total range of stimulus values employed in the investigation and would show enormous discrepancies, at the highest brightnesses, between the observed and calculated values.

Figure 10 shows the increase in the just noticeable difference, ΔS, with increase in the magnitude of the standard stimulus. The

values of ΔS are derived from the same y values as were those shown in the preceding graph and involve no new solution of the general equation. Both S and ΔS are here plotted logarithmically. The magnitude of ΔS increases from .04 millilambert to 3250 millilamberts as the brightness of the stimulus increases from .1 millilambert to 100,000 millilamberts—that is, by a ratio of a million to one. As may be readily observed, throughout this vast range the calculated values agree very closely indeed with the observed ones.

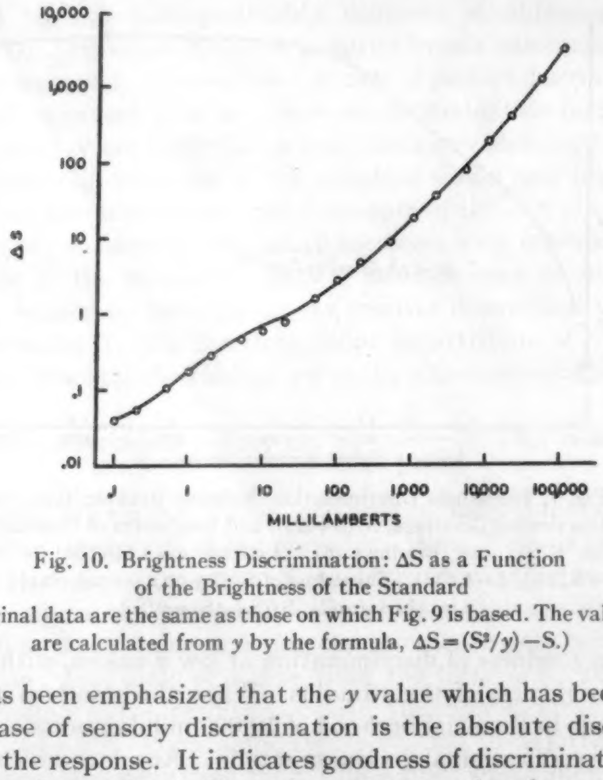

Fig. 10. Brightness Discrimination: ΔS as a Function of the Brightness of the Standard

(The original data are the same as those on which Fig. 9 is based. The values of ΔS are calculated from y by the formula, $\Delta S = (S^2/y) - S$.)

It has been emphasized that the y value which has been fitted in the case of sensory discrimination is the absolute discriminal value of the response. It indicates goodness of discrimination, not intensity of sensation. There is no reason, therefore, why our law should not apply to other forms of discrimination than discrimination of intensities. It quite certainly applies to pitch discrimination, as shown by Figures 11 and 12.

The measurements used are those obtained in the most recent of the numerous investigations of this matter, that by Shower and Biddulph (9). These investigators used a sinusoidal variation in vibration frequency, giving two variations in pitch per second, and

were careful to keep the intensity of tone constant at all pitches. The values plotted in the exposed figure are those for the measure of relative discriminal goodness, $f/(f+\Delta f)$, in which f is the frequency of the standard.[8] The graph indicates that the relative goodness of pitch discrimination increases with the vibration frequency of the standard up to a rate of nearly 2000 cycles and then slowly decreases.

Figure 12 shows the value of Δf—that is, the absolute just noticeable difference in pitch, when Δf is calculated from the values shown in the preceding figure. On account of the great range in the frequencies of the standards, they have been plotted logarithmi-

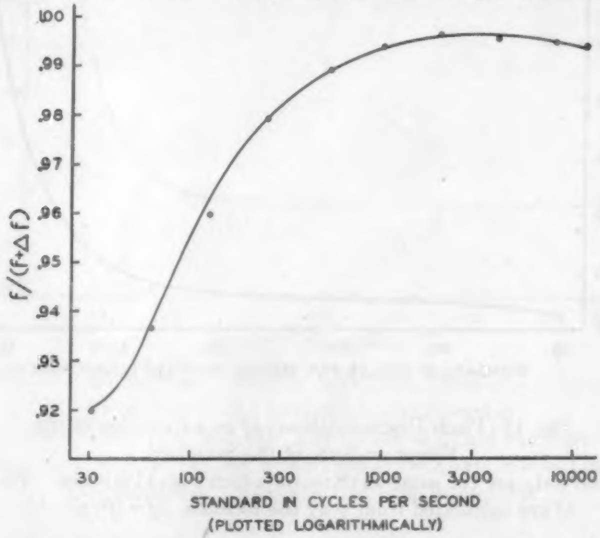

Fig. 11. Pitch Discrimination: Relation Between Relative Discriminal Goodness, $f/(f+\Delta f)$, and Vibration Rate of Standard
(Data from Shower and Biddulph (9). $p=13.7$; $k=1{,}110{,}609.5$; $f=.9999991$; $a=-5.33$; $d=0$. The values of $f/(f+\Delta f)$ are calculated by the formula, $f/(f+\Delta f)=y/f$.)

cally. The values of Δf, however, are plotted linearly. The curve shows that in terms of vibrations per second the just noticeable difference at first increases only slightly with increase in the vibration frequency of the standard, but at a frequency of about 3000 cycles begins to increase with great rapidity.

[8] When the standard varies only in frequency of vibration, it is customary to represent it by f instead of S. The definition of y, *i.e.* the absolute discriminal value, then becomes $f\left(\dfrac{f}{f+\Delta f}\right)$.

The last four figures (9, 10, 11, and 12) show the effect of change in an environmental variable upon discrimination. They should abolish forever the notion that psychophysics is a subject apart from the rest of psychology. The activities of organisms constitute the subject matter of all psychology; and when the activity studied happens to be that termed sensory discrimination, we are in the field of psychophysics. The fundamental laws of

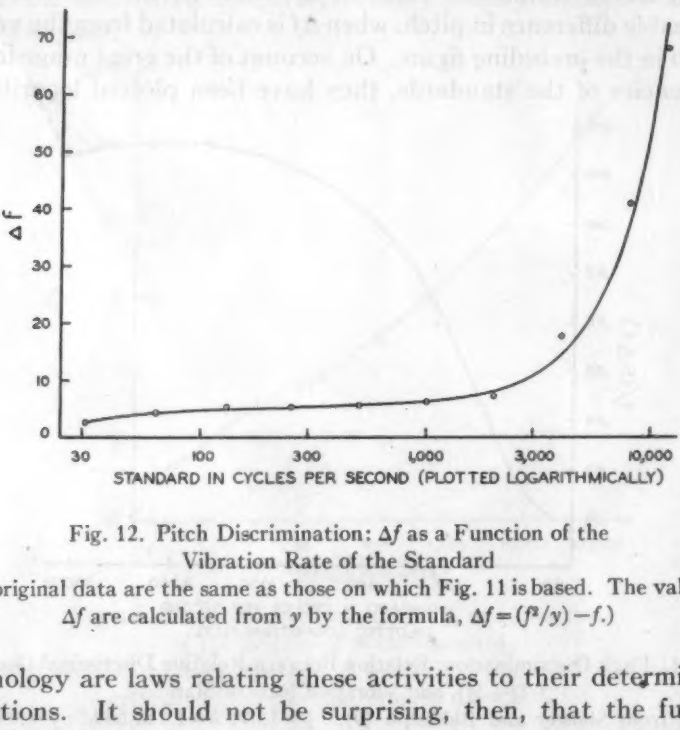

Fig. 12. Pitch Discrimination: Δf as a Function of the Vibration Rate of the Standard

(The original data are the same as those on which Fig. 11 is based. The values of Δf are calculated from y by the formula, $\Delta f = (f^2/y) - f$.)

psychology are laws relating these activities to their determining conditions. It should not be surprising, then, that the fundamental psychophysical law, correctly stated, turns out to be a law which also applies to such activities as maze running by white rats and memorizing paired associates by human beings.

While goodness of pitch discrimination is very largely a function of the vibration rate of the standard, as has been illustrated, it also depends upon the intensity of the standard. Shower and Biddulph (9) studied this matter, and one of their sets of data is represented by Figure 13. It shows the effect upon the just noticeable difference in pitch when, with the pitch of the standard kept constant at 2000 cycles, only the intensity of the sound is varied. As may be observed, the just noticeable difference *de-*

creases with increase in intensity. We are here a long way from Weber's law. It obviously has no application. There is thus provided a rather striking instance of the value of the reasoning here employed, by which both the pitch and the intensity of the standard are regarded as environmental variables constituting determining conditions of goodness of pitch discrimination. It then becomes possible to formulate the relation between either of these

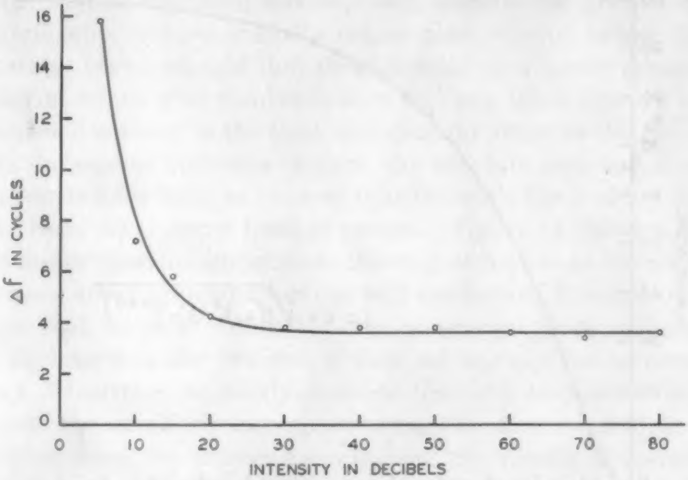

Fig. 13. Pitch Discrimination: The Just Noticeable Difference in Pitch (Δf) as a Function of the Intensity of the Stimulus
(Data from Shower and Biddulph (**9**). The values of Δf are calculated from y by the formula, $\Delta f = (f^2/y) - f$. $p = .1$; $k = 1996.4$; $f = .82007$; $a = -.1$; $d = 20.7$. The variable x is intensity measured in decibels.)

environmental variables and goodness of pitch discrimination by one and the same general law.

In the case of the data so far considered it is possible to assume that the psychological attribute has been measured in units which are objectively equal, or approximately so. By this is not meant that equal steps in score indicate equal steps in ability, a far more theoretical question, but simply that the primary units are equal, or very nearly so. Thus, a reaction time of two seconds is twice as long as one of one second; two errors made in a maze are twice one error; and a just noticeable difference of two millilamberts is twice as large as a difference of one millilambert. In the case of the measurement of intelligence, however, accomplished ordinarily by a motley variety of tests and types of scores, somehow

amalgamated into one total score, there exists no guarantee of approximate constancy in the unit of measurement, whether the total score be in terms of mental age or in terms of some total number of points. The only means of obviating this difficulty is the employment of an absolute scaling technique. Since these techniques all rest upon one or more assumptions, the validity of

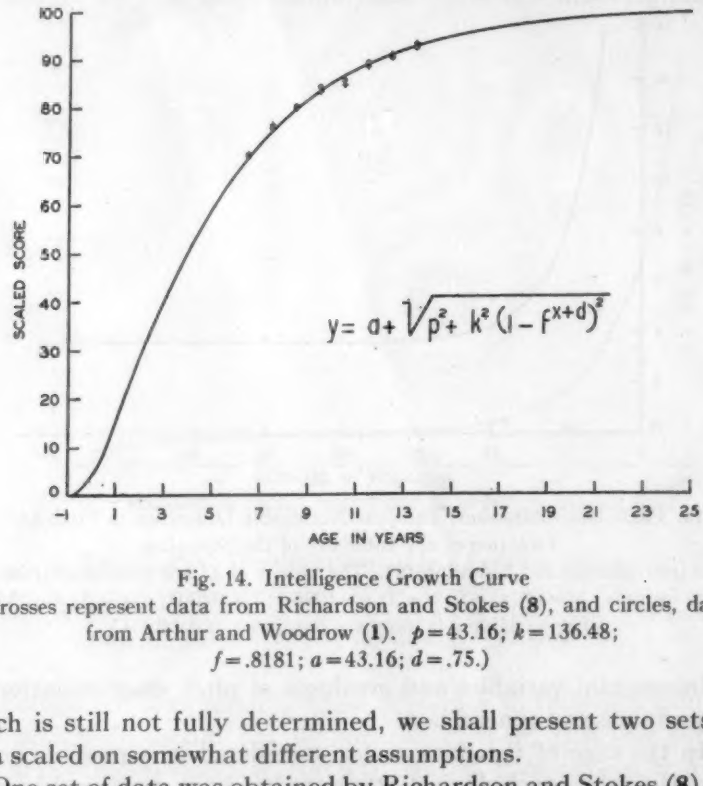

Fig. 14. Intelligence Growth Curve
(Crosses represent data from Richardson and Stokes (**8**), and circles, data from Arthur and Woodrow (**1**). $p = 43.16$; $k = 136.48$; $f = .8181$; $a = 43.16$; $d = .75$.)

which is still not fully determined, we shall present two sets of data scaled on somewhat different assumptions.

One set of data was obtained by Richardson and Stokes (**8**) and scaled by them by means of the well-known method devised by Thurstone. The other set of data, obtained many years earlier by Arthur and Woodrow (**1**), was scaled by a different method devised by them. This latter method is one which aims merely to weight the scores made in the various tests, before pooling them into a single score, according to their ability to differentiate children of any one chronological age from children of adjacent ages. Each set of data covers the same range in years—namely, 6½ to 13½, inclusive—and each was obtained by testing all the children

in a given community. Though the actual tests used in the two investigations were entirely different, and the populations tested belonged to different nations, both sets of data conform exceedingly well with the same general law, the law of the relation between environment and response which has now been shown to apply to widely different situations. In fitting this law to the present data, one theoretical condition was imposed, namely: the growth curve of intelligence should take its origin nine months before birth. It has also been assumed that the degree of intelligence present at the age of minus nine months is zero, but any other amount could be assumed without in the least changing the shape of the curve.

In the case of both sets of data, the absolute zero and the size of the units have been so chosen[9] that the scale has a value of 100 at the theoretical upper limit of growth. Figure 14 shows a curve fitted under these assumptions to the data of Arthur and Woodrow. This same curve appeared to fit so well the data of Richardson and Stokes that no new values for the parameters were calculated. It is obvious that the two sets of data are in excellent agreement; in fact, I fear they so nearly coincide that it is impossible to distinguish the small circles representing the data of Arthur and Woodrow from the crosses representing the results obtained by Richardson and Stokes. It should hardly be necessary to emphasize that each set of data should be regarded as indicating increase with age in the particular pool of tests employed, rather than increase in intelligence, with intelligence defined by reference to some criterion reached by factor analysis or by any other preferred definition. The curve could be termed an intelligence growth curve only in so far as the scores, throughout their range, were regarded as valid measures of intelligence.

In spite of the highly theoretical nature of the growth curve which has been drawn, it may be of some interest to note the percentage of ultimate growth shown by the average child at various ages. At birth he has reached 4%; at age 1, 16%; and at age $6\frac{1}{2}$, when he is in the first grade of the primary school, he has reached no less than 70% of his score at maturity.

[9] This was accomplished in the case of the data of Arthur and Woodrow by multiplying the yearly means by .6535 and adding 70.03; and in the case of the data of Richardson and Stokes, by multiplying by 7.581 and adding 76.39. Multiplication of the scaled norms is permissible, since it simply changes the size of the unit; and addition of a constant is permissible, since the zero point of the scaled score is at best an arbitrary one.

The illustrations which have been presented clearly indicate the possibility of generalizing by a single law the findings in numerous widely different experimental fields. It would be foolhardy, however, to claim that the law here enunciated should be considered as stating the ultimate truth. Certain complications may be foreseen arising from the multiplicity of types of units. For example, if the law holds for scaled intelligence test scores, it is not likely to hold for all the widely different, often ambiguous, types of scores now in use. A similar problem exists with respect to the type of unit used to measure the environmental variable, particularly in the case of intensity measurements. One or two rules, setting up certain criteria concerning types of scores, will be needed before the law may be freely employed. On the other hand, the fact of the great generality of this law, as well as its substantial accuracy, is believed to have been established.

It is believed, also, that this law constitutes a demonstration of the usefulness of the viewpoint maintained during its derivation. This viewpoint is one from which it is possible to examine the empirically established relations between psychological reactions and environmental variables directly, without first making detailed hypotheses concerning the internal happenings which may be imagined to bring about these relations; by means of such examination to determine what the relations existing in different situations have in common; and then to formulate the common features as general quantitative laws. It does not require much imagination to foresee the immense value of such generalizations. A few interrelated general laws should go far toward bringing order out of chaos in the whole field of quantitative experimental psychology.

APPENDIX I

Observed and Calculated Values for Figures 1 to 14

x	y	$\hat{y}$	x	y	$\hat{y}$	x	y	$\hat{y}$
	Figure 1		9	10.83	10.66	4	4.00	4.25
1	.17	.17	10	11.00	10.88	5	3.35	3.46
2	1.75	1.80	11	10.83	11.03	6	2.85	2.86
3	4.17	4.36	12	11.25	11.13	7	2.60	2.41
4	6.33	6.49				8	2.58	2.06
5	8.00	8.04		Figure 2		9	2.04	1.80
6	9.25	9.11	1	7.70	7.70	10	1.95	1.61
7	10.00	9.84	2	6.58	6.44	11	1.42	1.47
8	10.42	10.33	3	4.86	5.23	12	1.53	1.36

APPENDIX I (cont.)

Observed and Calculated Values for Figures 1 to 14

x	y	$\hat{y}$
13	1.59	1.28
14	1.59	1.22
15	1.04	1.18
16	1.12	1.14
17	1.22	1.12
18	1.03	1.10
19	1.06	1.09
20	1.29	1.08
21	1.11	1.07
22	.93	1.06
23	.92	1.05
24	.96	1.05
25	1.15	1.05
26	1.18	1.05
27	1.04	1.05
28	1.02	1.05
29	.75	1.05
30	.77	1.05

Figure 3

x	y	$\hat{y}$
1	170	170.0
2	100	102.5
3	62	65.3
4	50	44.9
5	36	33.7
6	25	27.5
7	26	24.1
8	41	22.3
9	20	21.2
10	21	20.7
11	15	20.4
12	22	20.2
13	14	20.1
14	28	20.1
15	16	20.0
16	23	20.0
17	19	20.0
18	14	20.0
19	20	20.0
20	23	20.0
21	20	20.0
22	14	20.0
23	16	20.0
24	27	20.0
25	37	20.0
26	30	20.0
27	33	20.0
28	20	20.0
29	23	20.0
30	25	20.0

Figure 4

x	y	$\hat{y}$
1	51.8	51.0
2	58.7	57.4
3	63.4	63.4
4	70.5	69.1
5	79.5	74.3
6	82.6	79.2
7	82.2	83.8
8	78.2	88.0
9	85.2	92.0
10	90.9	95.6
11	100.0	99.0
12	100.0	102.2
13	103.6	105.1
14	107.0	107.8
15	110.9	110.2
16	114.3	112.6
17	115.5	114.7
18	116.5	116.7
19	118.3	118.5
20	120.2	120.2

Figure 5

(Upper Curve)

x	y	$\hat{y}$
4	204	204.0
8	199	198.0
12	202	200.5
16	204	205.8
20	213	211.2

(Lower Curve)

x	y	$\hat{y}$
1	150	147.2
2	139	139.0
4	152	150.1
8	169	172.5
12	184	187.0
16	196	196.2
20	202	202.1
24	204	205.8
28	208	208.3
32	208	209.8

Figure 6

x	y	$\hat{y}$
1.00	2.831	2.890
2.00	.826	.965
2.66	.668	.564
3.33	.450	.397
6.66	.336	.282
10.66	.282	.281
16.66	.255	.281
33.33	.251	.281

Figure 7

x	y	$\hat{y}$
1	21.73	27.89
2	13.40	8.57
4	3.40	2.01
7	1.75	1.51
14	1.65	1.50
28	1.50	1.50

Figure 8

x	y	$\hat{y}$
1	1.634	1.467
2	3.563	3.631
3	5.338	5.330
4	6.296	6.616
5	7.521	7.577
6	8.366	8.288
7	9.099	8.811
8	9.352	9.197
9	9.586	9.480
10	9.690	9.688
11	9.777	9.839
12	9.843	9.952
13	9.957	10.032

APPENDIX I (cont.)

Observed and Calculated Values for Figures 1 to 14

Figure 9

x	y	$\hat{y}$
.1	.7163	.7160
.2	.7886	.7860
.5	.8278	.8316
1	.8547	.8548
2	.8803	.8766
5	.9184	.9090
10	.9450	.9334
20	.9629	.9576
50	.9690	.9690
100	.9738	.9754
200	.9780	.9788
500	.9823	.9809
1,000	.9818	.9815
2,000	.9823	.9817
5,000	.9837	.9815
10,000	.9824	.9809
20,000	.9799	.9795
50,000	.9747	.9754
100,000	.9685	.9685

Figure 10

x	y	$\hat{y}$
.1	.0396	.0397
.2	.0536	.0545
.5	.1040	.1012
1	.170	.1699
2	.272	.2816
5	.444	.5005
10	.582	.7135
20	.770	.886
50	1.60	1.60
100	2.69	2.52
200	4.50	4.34
500	9.0	9.75
1,000	18.5	18.8
2,000	36.0	37.2
5,000	83.0	94.0
10,000	179.	195.0
20,000	410.	418.0
50,000	1300.	1260.
100,000	3250.	3250.

Figure 11

x	y	$\hat{y}$
31	.9197	.9203
62	.9365	.9376
125	.9596	.9628
250	.9792	.9796
500	.9891	.9890
1,000	.9939	.9939
2,000	.9964	.9960
4,000	.9956	.9964
8,000	.9949	.9953
11,700	.9942	.9939

Figure 12

x	y	$\hat{y}$
31	2.706	2.68
62	4.204	4.13
125	5.262	4.83
250	5.300	5.21
500	5.500	5.54
1,000	6.100	6.17
2,000	7.200	8.02
4,000	17.600	14.34
8,000	40.800	37.79
11,700	67.860	72.36

Figure 13

x	y	$\hat{y}$
5	15.80	15.92
10	7.20	8.15
15	5.80	5.29
20	4.20	4.23
30	3.80	3.70
40	3.80	3.62
50	3.80	3.61
60	3.60	3.61
70	3.40	3.61
80	3.60	3.61

Figure 14
Arthur-Woodrow

x	y	$\hat{y}$
6.5	70.03	70.05
7.5	75.65	75.40
8.5	80.03	79.84
9.5	84.21	83.47
10.5	85.71	86.45
11.5	89.18	88.90
12.5	90.42	90.92
13.5	92.25	92.56

APPENDIX I (cont.)

OBSERVED AND CALCULATED VALUES FOR FIGURES 1 TO 14

x	y	$\hat{y}$	x	y	$\hat{y}$
Richardson-Stokes			9.5	83.21	83.47
			10.5	85.25	86.45
6.5	70.53	70.05	11.5	88.45	88.90
7.5	76.39	75.40	12.5	90.92	90.92
8.5	79.78	79.84	13.5	93.06	92.56

BIBLIOGRAPHY

1. ARTHUR, G., & WOODROW, H. An absolute intelligence scale: a study in method. *J. appl. Psychol.*, 1919, **3**, 133, Table V (column headed 6 mo.).
2. HULL, C. L. Quantitative aspects of the evolution of concepts: an experimental study. *Psychol. Monogr.*, 1920, **28**, 75 (Subject Cha).
3. KRUEGER, W. C. F. The effect of overlearning on retention. *J. exp. Psychol.*, 1929, **12**, 75, Table III (savings method, with no overlearning).
4. LANDAHL, H. D. Contributions to the mathematical biophysics of the central nervous system. *Bull. math. Biophysics*, 1939, **1**, 114, 116.
5. MOORE, T. V. The analysis of association by its equational constants. *In* Hart, C. A. (Ed.), *Aspects of the New Scholastic Philosophy*. New York: Benziger, 1932. P. 208.
6. NUTTING, P. G. The complete form of Fechner's law. *Bull. U. S. Bur. Stand.*, 1907, **3**, 60, Table 1 (wave-length 575).
7. PIÉRON, H. Nouvelles recherches sur l'analyse du temps de latence sensorielle et sur la loi qui relie ce temps à l'intensité de l'excitation. *Année psychol.*, 1920–1921, **22**, 61.
8. RICHARDSON, C. A., & STOKES, C. W. The growth and variability of intelligence. *Brit. J. Psychol. Monogr. Suppl.*, 1933, **6**, 8, Table V.
9. SHOWER, E. G., & BIDDULPH, R. Differential pitch sensitivity of the ear. *J. acoust. Soc. Amer.*, 1931–1932, **3**, 279 (intensity 10 decibels).
10. STONE, C. P. The age factor in animal learning. *Genet. Psychol. Monogr.*, 1929, **5**, 93. (The y-values used were read from a magnified projection of the graph for rats of ages 31–60 days.)
11. WOODROW, H. The measurement of attention. *Psychol. Monogr.*, 1914, **17**, No. 76, 42, Table V; 23, Table I (Subject Vs).
12. WOODROW, H. Interrelations of measures of learning. *J. Psychol.*, 1940, **10**, 51.

A SECOND REVIEW OF 16-MILLIMETER FILMS IN PSYCHOLOGY AND ALLIED SCIENCES

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Since the publication of the first review of psychological films (**257**) several important advances have been made in the field of 16-millimeter instructional motion pictures. The more important developments include: (a) a steady increase in the number of talking films, (b) the production of color film duplicates, (c) an influx of foreign educational films of high merit, (d) the release of many Hollywood theatrical films for classroom use, (e) evaluations of films by competent previewing panels, and (f) the establishment of several psychological film libraries, including the Psychological Cinema Register (**267**), Warden and Gilbert Films (**276**), and the College Film Center (**262**).

Although color in 16-millimeter films is as old as sound, only original color prints have been extant, which necessarily limited the use of this type of film. Recently, satisfactory color duplicates have begun to appear, and, though far more costly than black-and-white duplicates, they mark a significant step in the evolution of the educational film. With the union of natural color and sound, striking realism in classroom films now waits only on the perfection of apparatus for projecting stereoscopic motion pictures in such a way that the natural color is retained.[1]

With the large number of instructional films produced in this country and the steady flow of pictures from abroad, the average user's task of selecting the better films is not an easy one. The scanty and oftentimes biased information given in commercial film catalogs is of little assistance. In England, careful evaluations of psychological and other classroom films by educational experts have been provided since 1933 by the British Film Institute through its *Monthly Film Bulletin* (**261**). Following in part the example of the British Film Institute, the American Association

[1] At least three companies, the Society for Visual Education (**272**), Leitz (**252**), and the Three Dimension Corporation (**275**), distribute projectors and Polaroid materials for projecting and viewing tridimensional still pictures in natural color. There are no serious obstacles to the use of similar techniques for showing stereoscopic cinematographs. Research on the production of the stereoscopic effect from a single strip of polarized film already is well under way (**269**).

of School Film Libraries (**255**) and the H. W. Wilson Company (**263**) now offer critical reviews and appraisals of instructional films in their annual catalogs. As the coverage is extended, these catalogs undoubtedly will become the standard source books of classroom films.

Educators have long been aware of the instructional merits of many theatrical films. Until recently, however, Hollywood producers have been reluctant to permit their pictures to be used as teaching aids. Through the efforts of a number of groups, including the American Council on Education (**252**), the Progressive Education Association (**271**), Teaching Film Custodians (**274**), and Films, Inc. (**266**), hundreds of one-reel excerpts and full-length feature pictures are now available for classroom use with few restrictions. The best-known series has been prepared by the Commission on Human Relations of the Progressive Education Association and contains 55 excerpts from well-known feature films. These fictional pictures are cryptically edited to illustrate specific social problems that arise in child training, marital relationships, club contacts, racial conflicts, mob actions, and allied group situations. Their use is legally restricted to regularly established classes or study groups in educational institutions and organizations within the continental United States. Each application for rental of the pictures must be made on the legal form provided or approved by the Commission and mailed to the film library serving the particular territory.[2] Since each of these films is described fully in the catalog and study guides of the Association (**271**), the individual summaries are omitted here.

This review gives a survey of only those psychological films which have appeared since 1938 or were omitted through oversight from the first summary (**257**). In a few instances major revisions of old films or the withdrawal of a block of films from circulation are cited. In the bibliography specific information about each film is provided, including the names of producer and distributor, the

[2] The six film libraries distributing these pictures and their respective districts are as follows: Free Film Service, School of Education, Boston University, 29 Exeter St., Boston (New England); New York University Film Library, 71 Washington Square, New York City (New York area); University System of Georgia, 223 Walton St., N. W., Atlanta (Southern States); College Film Center, 59 E. Van Buren St., Chicago (Midwestern States); Bureau of Visual Instruction, University of Oklahoma, Norman (Southwest); Department of Visual Instruction, University of California, Berkeley (Pacific Coast).

title, length, date of production, rental and sale costs, and the kind of each film, *i.e.* monochrome or color, silent or sound.

History and Production of Films

The Museum of Modern Art Film Library (**270**) distributes two series of films, grouped into 11 programs, which portray the advance of the theatrical film in America. A fine survey of these programs as well as the work of the Film Library is provided in the film, *Movies March On* (**186**). A complete history of photography with emphasis upon the development of the cinema is delineated in *Evolution of the Motion Picture* (**18**). The contributions of Da Vinci, Kirther, Rodet, Plateau, Daguerre, Sellers, and Edison, among others, are reviewed. Old-fashioned projection lanterns are shown in operation. The terminal sequences review the steps which led to the perfection of the modern talking picture. A short history of silent motion-picture entertainment is given in the film, *Silver Shadows* (**58**). The early photographic discoveries of Talbot and Armat are depicted and explained in a Gutlohn film (**2**). A related picture, *How Motion Pictures Move and Talk* (**32**), makes plain the mechanical, electrical, and visual principles through which modern sound films are made possible.

A series of six "technique" films have been carefully prepared by the Harmon Foundation for aiding the amateur cinematographer. The titles include *How To Use Your Camera* (**222**), *Common Mistakes and How To Correct Them* (**218**), *Exposure and Exposure Meters* (**219**), *Film Editing* (**220**), *How To Use Filters* (**221**), and *Lenses and Their Uses* (**41**). A careful study of these six films, together with the *Bulletin* article by Stone, Valentine, and Miles (**273**), would seem advisable for those who, for one reason or another, must produce films without professional assistance.

Development of Behavior

Heredity

Two films dealing with heredity in animals (**129**) and man (**130**) have been arranged by Huxley and Hewer for Gaumont-British Instructional Films Bureau. The first film on animals is a two-reel subject which surveys the mechanisms and principles of heredity. By means of animated diagrams the cell nuclei at the time of condensation of chromatin and the formation of chromosomes are shown. Additional schematic diagrams illustrate the processes of mitosis, meiosis, and the formation of the zygote. The independent

segregation of more than one pair of genes involved in a cross is shown by interbreeding long-haired albino rabbits with short-haired black ones. When two allelomorphic pairs affecting the same structure are present, gene interaction occurs. The film shows that rose-combed fowls crossed with pea-combed fowls produce walnut-combed birds. The commentary fails to explain that the Mendelian ratios, neatly shown in the film, are theoretical expectations. It also fails to point out in the poultry crosses that the single-combed fowl does not always breed true, but frequently gives rise to a split comb. The second picture, treating of heredity in man, is designed as a continuation reel to the animal picture. Actually, there is little, if any, connection between them. A number of superior British genealogies are presented, from which the viewer is led to infer that heredity plays a leading role in physique, musical talent, and artistic abilities. These pedigrees are contrasted with another in which a large share of the offspring is either feeble-minded or crippled. There is no comment on the fact that different forms of mental defect may be transmitted in different ways or that some are not inherited at all. The Eugenics Society of London, after re-editing and condensing the animal film, added it to the human film and distributed both under the title, *From Generation to Generation* (**133**). For teaching purposes the original version of the animal film is preferable. In spite of the criticisms, these films are superior to anything on heredity produced in this country. The one-reel picture by Strandskov (**224**), although well photographed, is brief and oversimplified. It shows monohybrid and dihybrid crosses in cattle and guinea pigs, respectively, which are used to illustrate the Mendelian principles of dominance, recession, and segregation.

Antenatal and Early Postnatal Growth

A film on embryology, produced by the U. S. Department of Agriculture (**30**), won international recognition for its fine cinematic treatment. Through micromotion pictures, supplemented by animated diagrams, the film traces the development of the rabbit embryo from the fertilization of the egg to the twenty-second day of embryonic life. Lewis and Gregory (**161, 162**) and Eastman (**16, 25**) also have pictures which portray the early development of the rabbit egg. Lewis and Hartman (**163**) have recorded cinematographically the early divisions (two- to eight-cell stage) of the living monkey egg. The film by Strandskov (**225**) presents in an elemen-

tary form the processes of fertilization, cleavage, fetal growth, and parturition of the pig.

In the fine British film on the development of the chick (**132**) the internal structure of the egg is explained diagrammatically, and this is followed by microphotographs which show growth from the six-hour stage to hatching. The formation of the blastoderm, primitive streak, neural groove, brain, foregut, heart, eyes, and area vasculosa is seen in detail. In a second reel the rapid growth of the whole embryo, the development of wings, feet, beak, and feathers, and the use of the allantois and yolk sac are shown clearly. Finally, hatching is seen in detail, and the subsequent growth of the chick to maturity is shown in a series of photographs taken at various stages from one hour to eight months. Two related pictures of merit trace the development of the trout (**87**) and the tadpole (**120**).

Warden and Jackson (**241**) have photographed the successive developmental phases of the white rat from birth to three months of age. The sensory and motor capacities of the young plus the maternal care and nesting behavior of the adults are shown.

Additional films which deal wholly or in part with prenatal and early postnatal development include *How Life Begins* (**31**), *Living World* (**44**), *Leaping Through Life* (**77**), and the *Gift of Life* (**28**). The last picture provides, among other things, a rather complete and accurate presentation of the biology of sex.

Plant and Animal Behavior

With time-lapse photography the slow growth-movements of plants occurring over a period of hours or days can be presented on the screen in a few seconds. The visual effect is a startling illusion. In the film, *Plant Power* (**142**), the tendrils of vines are seen waving back and forth until a supporting object is touched, when the tendrils quickly form a tight coil. The tender shoots of lily-of-the-valley press against a plate glass that covers them. Slowly the shoots push the glass aside and in their rapid growth appear to wave triumphantly in the air. The reactions of plants to light, air, gravity, and anesthetics are demonstrated in the film, *Sensitivity of Plants* (**143**). Among other things, it shows vividly the differential reaction of the sensitive plant, *Mimosa pudica*, to weak and strong stimulation. For additional films of this kind, the reader should consult the *Educational Film Catalog* (**263**).

A generous number of excellent pictures are available on the

natural behavior of marine animals (**246, 247, 248**), insects (**27, 140, 141, 212, 227, 245, 249**), and unicellular organisms (**48, 62, 131**). Representative films in this group are the photographic studies of ants and bees by Kaufman (**140, 141**), spiders and marine organisms by the Woodards (**247, 248**), and the paramecium by Huxley and Hewer (**131**). Many similar films are currently listed in the *Educational Film Catalog* (**263**).

The evolution of locomotor and prehensile organs is traced in a Strand film, *Fingers and Thumbs* (**148**). Pictures, diagrams, and an informative commentary present morphological relationships between the fins of fish, the vestigial claws of reptiles, the wings of birds, and the limbs of various mammals. Hoofs, claws, flippers, and hands are shown in rapid succession. It is pointed out graphically that the hands of some infraprimates and all primates have been released as locomotor organs and at times are used as prehensile organs. The hand of the chimpanzee is then shown, and its function is indicated in a series of splendid scenes depicting a "chimp" unlocking a padlock, using a mug and spoon, striking a match, lighting the cigarette of the keeper, and wiping its body with a towel. The film ends with sequences showing the hands of a human infant and adult. This picture is well suited for instruction in comparative psychology and related courses.

The natural behavior of gibbons and orangutans is portrayed in a film by Carpenter (**81**). A second picture (**80**) exhibits the behavior of free-ranging rhesus monkeys in the colony on Santiago Island. Feeding, play, grooming, dominance relationships, and sexual behavior are shown. The picture by Legg (**147**) traces individual and social development among different species at the primate level. Comparisons are drawn from the natural activities of baboons, gibbons, orangutans, chimpanzees, gorillas, and men.

A picture by Billingslea (**75**) differentiates between emotional and nonemotional rats. The emotional animals tend to be more active, curious, and persistent as long as the situation is a familiar one. Constitutional differences in dogs are depicted in a film by James (**137**). Conditioned avoiding reactions are established in both pure-breed and hybrid animals. The film clearly reveals the physical form and behavior that go with excited, inhibited, and variant types of animals.

Mowrer and his associates, in an ingenious series of experiments, have demonstrated a variety of social complications which result from competition among rats. In an initial film (**202**) the

difference between groups of rats that have been reared together and in isolation is shown. The former group compete vigorously when a pellet of food is dropped into the cage. The second, or isolated, group must learn the knack of competition. Eventually, there emerges with both groups a kind of coöperation or sharing which permits more rapid eating by all the rats. When the situation is altered so that one member can escape with the food, sharing immediately disappears. In a second film (**203**) each of three littermate male rats learns to "make a living" by pressing a bar which releases a pellet of food. The bar is now moved to the far end of the apparatus so that more "work" must be done for the same "pay." By placing three rats in the apparatus together, a "social problem" arises: the animal that "works" has the least chance of securing what he has "produced." Total "production" rapidly declines, and during the "depression" the animals compete at the food box for food that is not there. Finally, the animals, ravenously hungry, "attack" the bar. One animal learns that by rapidly activating the bar and dashing to the food box he sometimes can obtain a pellet. His litter mates eventually become satiated, and the problem is solved. One rat continues as the worker, and the others become completely parasitic: a class society emerges. In a third film (**204**), three rats that have lived together in an "economy of abundance" are placed in a small glass cell and allowed to become hungry. When bits of food are introduced, there is active competition, but little fighting. As hunger increases, the competition gives way to savage fighting and a dominance hierarchy emerges. The dominant and intermediate rats fare well, but the subordinate rat eats hesitantly, even when alone, and quickly drops food when other animals are introduced. The film explains that "personality typing" based on this kind of social experience seems to be relatively permanent. The quality of photography and composition in this film is below the standard set by the first two.

Infant and Child Behavior

A silent picture prepared by Gesell (**102**) shows in fine detail the procedures for developmental examinations. Critical transformations in infant behavior are delineated in a series of 24 short, carefully edited, normative films (**101**) which deal with ball, bell and cup behavior, cup and cubes, cup and spoon, consecutive cubes, dangling ring, formboard, massed cubes, mirror, paper and crayon, pellet, pellet in and beside bottle, performance box, prone

behavior, rattle, rattle and string, ring, string and bell, sitting, spoon behavior, standing, stair climbing, supine behavior, and tower building. The patterning of prone behavior is dealt with at greater length in a separate film (**100**). The tonic neck reflex (**103**) likewise is depicted separately in its morphogenetic and clinical significance. The individuality in infancy (**99**), as well as clinical case studies of developmental deviations (**98**), is shown with characteristic thoroughness.

McGraw (**168**) has edited a film on crawling and creeping to illustrate the gradual expansion of neuromuscular control of one infant in the attainment of a well-coördinated palm-knee performance. The age period covered is from neonatal crawling movements until integrated creeping is well established at the age of 12 months. The development of erect locomotion (**177**) is illustrated in a pair of one-reel films. The first reel deals exclusively with the technique of photographing dots placed at selected points on the body. The paths of the dots on the film correspond to the spatial movements of bodily members. The second reel is a longitudinal study of one subject, demonstrating the sequential changes from reflex-stepping phase until the child has attained a well-integrated gait. In a picture of the Moro embrace pattern, McGraw (**170**) points out that the characteristic response in the newborn is a flooding of all motor segments caudal to the midbrain. With increase in age, the intensity of the response diminishes until all that is left is a slight body-jerk. Characteristic reactions of the newborn infant are surveyed in a general film on reflex behavior (**178**) and in specific films dealing with grasping (**180**), swimming (**181**), the plantar response (**169**), and postural adjustments to an inverted position (**176**). Additional films portray the maturation of neuromuscular mechanisms which operate in the assumption of sitting and erect postures (**173**, **174**), the achievement of erect locomotion (**175**), the perfection of reaching-prehensile reactions (**172**), and the changing reaction of an infant to a pin prick (**171**). A final film (**179**) compares the reflex swimming movements in the newborn of different species. A neonatal rat, opossum, rabbit, guinea pig, kitten, monkey, and human all exhibit striking behavioral similarities when placed in the water for the first time.

Many of the films by Lewin and his associates have been either withdrawn from circulation or re-edited. The pictures now available are *The Child and the Field Forces* (**156**), *Walking Upstairs for the First Time* (**158**), *Field Forces as an Impediment to a Perform-*

ance (**157**), *Level of Aspiration in Young Children* (**159**), and *Experimental Studies in Social Climates of Groups* (**160**). The last film, which is the only one not listed in the first review, illustrates reactions of grade-school children within certain social groups, the psychological structures of which are democratic, autocratic, and laissez-faire. Differences in aggression, in-group conflicts, and allied social interaction are brought out clearly in the film.

A series of five films dealing with successive steps in child care and training have been produced by Hill. The titles of the films describe their content and age level: *Before the Baby Comes* (**121**), *The First Year* (**123**), *The Child Grows Up* (**122**), *Life of a Healthy Child* (**124**), and *Road to Health and Happiness* (**125**). Advice to mothers in the care of their newborn infants is provided in the film by Tollefson (**228**). The Wisconsin Board of Health has sponsored three films entitled *Judy's Diary Series* (**40**, **9**, **47**). The first reel presents the feeding and physical care of Judy at 6 months of age; the second depicts the development of the child from 9 to 18 months; and the third shows Judy at 2 years. The feeding, care, and incidental social relations of the Dionne quintuplets are illustrated in a Gutlohn film (**53**). Some aspects of the emotional relations between parent and child are dealt with in a film by Marvin (**188**). Early structural abnormalities and injuries to the newborn are treated in two films entitled *Injuries of the Newborn* (**85**) and *How We Get To Be Human* (**145**).

Response Mechanism

Receptors and Receptive Processes

(a) *Vision.* The structure and function of the eyes are depicted in several silent and sound films (**20**, **21**, **23**, **34**, **35**, **56**). The best pictures in the group are two Eastman films (**20**, **21**) and a sound picture by Knowledge Builders (**34**). This last film presents a brief introduction to ocular anatomy and traces the path of light through the eye to the retina. The mechanism of accommodation is fully explained with beautiful illustrations and animated diagrams.

The physical basis of color is shown in striking fashion in the free film, *Curves of Color* (**15**). The level of this picture is such that it can be used effectively in either elementary or advanced classes. It explains Newton's experiments with the spectrum, and a diagram shows the entire electromagnetic spectrum. The relation of color to wave length and to reflection or transmission of light waves

is illustrated. The problems involved in color matching are explained, and the use of the new recording photoelectric photometer to give a graphic representation of color components is shown.

The scope of the national sight-saving movement is surveyed in a film (**52**) which reviews the everyday precautions to be followed in the home, school, and industry. The picture provides several graphic examples of visual defects arising from ignorance and neglect. External diseases of the eye and routine orthoptic training with motor anomalies are exhibited in a pair of films (**19**, **49**) which have been edited more for professional than for classroom use.

(b) *Audition.* The nature of the auditory stimulus is superbly treated in a sound film, *Vibratory Motions and Waves* (**61**). By means of slow-motion photography, animation, and appropriate sound effects, the concepts of wave length, phase, crest, trough, nodes, antinodes, condensation and rarefaction, and transverse and longitudinal waves are vividly presented. A related film (**60**) briefly demonstrates the physical correlates of pitch and loudness.

The structure of the ear is explained in the film, *How We Hear* (**33**). The relationships between pressure variations in the air, the action of the ossicles and the endolymph, and the initiation of auditory impulses are shown in considerable detail.

The story of the hard-of-hearing is told in a commercial film sponsored by Western Electric and produced under the direction of Fletcher (**92**). A section of the film demonstrates the use of audiometric tests for measuring the extent of hearing loss.

(c) *Static Sense.* The importance of the static sense in behavior is well illustrated in the film by Neff, Smith, and Kappauf (**205**). The behavior of cats following the transection of first one and then both vestibular nerves is shown. With unilateral impairment the animals roll, move the head, and turn in the air towards the side of the injury. Bilateral sectioning is followed by forced rotary movements of the head, hyperextension of the limbs, disturbance of the righting reaction, and inability to stand. In time, the severity of the symptoms decreases until the cat can walk. A cinematic review of the standard clinical tests of static function in human subjects has been prepared by Lyman (**167**).

Nervous System

The evolution of the nervous system, including the structure of nerve cells, spinal cord, and brain, is portrayed in nine reels of a

Russian film (**209**). A briefer treatment of the same subject matter is presented in a silent film distributed by Carter (**7**). A picture by Sarnoff (**211**) shows the gross topography of the human brain. The method of recording action currents from the human brain and the types of electroencephalograms found in normal, functional, and organic states are depicted in the picture by Bennett and Cash (**73**).

In a series of research films on cats, Masserman demonstrates the role of the hypothalamus as a nervous center for a variety of sympathetic reactions suggestive of fear and rage. The first film (**193**) shows that faradic stimulation of the hypothalamus induces such responses as mydriasis, erection of the hair, sporadic vocalization, and certain "emotional" attitudes. Total destruction of the hypothalamus (**192**) causes persistent stupor, which may give way to somewhat disorganized manifestations of rage when the animal is annoyed or restrained. Two additional films (**191, 194**) in natural color show the sensitization of the hypothalamus by injections of the analeptic drug, picrotoxin, and the reaction of the heart to electrical stimulation of the hypothalamus. The first film shows that the drug increases hypothalamic reactivity as evidenced by profuse salivation, alternating periods of wailing and panting, dilated pupils, extruded claws, a lashing tail, and a frenzied darting about the cage. The injection of a solution of metrazol into the hypothalamus induces a syndrome of sympathetic and motor reactions resembling a frenzy of rage and fear (**190**). Further experiments demonstrate that subintoxicant doses of alcohol have a mildly stimulating effect on both the cortex and the hypothalamus (**199**). Large injections, however, diminish the reactivity of the cortex, but alter only slightly the motor and sympathetic responses of the hypothalamus (**189**). These experiments as a group point to the conclusion that the hypothalamus is not *the* nervous center for emotion, inasmuch as direct stimulation of it releases only mimetic reactions that are stereotyped, nonadaptive, and shammed. Additional evidence for this position is contained in the films which are reviewed in a later section on *Experimental Neurosis*. Although these films are of great importance, prospective users should realize that they are technical research pictures and are not easily adapted to instruction in elementary psychology.

Ablation of the entire frontal areas of the cortex in cats abolishes the placing and hopping reactions, as is demonstrated in the film by Smith (**214**). The animals are practically unable to learn a

complex habit, such as pulling a string for a ball which in turn can be used to secure food. Removal of the visual cortex (**215**) does not impair pupillary reflexes, righting reactions, and optic pursuit movements. However, visual placing reactions are disturbed, and it is shown that the animals avoid obstructions with difficulty. Significantly, they also lose the ability to discriminate brightness under conditions of light adaptation, but learn to discriminate with low illumination.

For the study of human subjects with cerebral lesions, Halstead (**112**, **113**, **114**, **115**) reviews several qualitative criteria which can be used advantageously, including tests of stereognosis, visual fields, social behavior, and response equivalence.

Hulin and Moore (**128**), working with the nervous system of an invertebrate organism, show the behavioral antagonisms which result when the nerve ring of the starfish is severed.

Effectors and Levels of Response

The sound film, *Endocrine Glands* (**79**), suggests more by its title than it presents. The loci and partial functions of only four glands are portrayed: the parathyroids, thyroid, pancreas, and pituitary. Experiments with mice and a goat are used to demonstrate that the secretion of the thyroid influences oxygen consumption and that of the parathyroids, the calcium content of the blood. The manufacture and human use of insulin is shown sketchily. The film terminates with a series of animated diagrams which bear on the importance of pituitary hormones in ovulation and lactation. Since it neglects the role of the glands in growth and motivation, this film will find little use outside elementary classes in physiology.

The joint control by the endocrine and nervous systems of color changes in fish is nicely illustrated in a Rutgers film (**13**). The killifish, *Fundulus*, is placed on blue, black, white, and yellow backgrounds. In each case the skin pigment corresponding to the predominant color migrates, while the other pigments remain obscure and concentrated in the chromatophores. With the squid, *Loligo*, on the other hand, the pigment is contained in elastic sacs which are changed in shape and area by muscular contraction. In this case the color changes are evoked solely by nervous impulses which activate the muscular fibers.

A film that has interesting implications for the nature of nervous organization has been prepared by Girden (**107**). Puppies are curarized, and in the drugged state a conditioned flexion of the

semitendinosus muscle to a bell is established. Upon recovery from the drug it is shown that the conditioned response cannot be elicited. However, when the puppy is recurarized, the conditioned response reappears without reinforcement. A title in the film states that, conversely, a conditioned reaction set up in a normal animal can be evoked in successive normal states, but disappears with the administration of curare. From these facts the hypothesis is offered that curare produces a change in the level of nervous organization, a functional decortication. Although this film contains a wealth of pertinent material for general psychology, it is doubtful whether tender-minded elementary students can bear the operative sequences.

A short survey of autonomic activity is provided in the film by Lindsley and Sassaman (**164**). The initial sequences show a hirsute man who can raise the hairs all over his body "at will." On a signal from the experimenter the hair on his arms or legs or any spot is raised and lowered. Accompanying the "voluntary" pilomotor response is a general sympathetic discharge indicated by increased heart rate, blood pressure, rate and depth of respiration, galvanic skin response, dilation of the pupils, and changes of the brain potentials from the premotor area. All these reactions are demonstrated with appropriate laboratory apparatus. The film closes with a final hair-raising episode.

Learning[3]

An extensive photographic record of the forms of animal learning is provided in the instructional films by Smith and Kappauf (**216**, **217**). The cat is used as the experimental animal throughout. The first reel shows (a) three kinds of conditioned avoidance reactions and (b) problem-solving with strings and a ball that is pushed into a slot. The second reel deals with (c) discrimination learning involving visual and auditory patterns and (d) compound learning as exemplified by the acquisition of alternation and token-reward habits. A separate picture (**213**) traces the

[3] In the first review, a film, entitled *The Intelligence of White Rats*, by Shepard was attributed erroneously to Maier. A film by Maier (**183**) with the same title was omitted from the review. This film shows the rat learning the paths of a complex situation made up of tables and elevated pathways. When the route to the food is later interrupted by the removal of a section of pathway, the rat adapts by descending to the floor, crossing the gap, ascending to the pathway, and thus reaching the food. This adaptation shows the ability of the rats to grasp the situation as a whole.

acquisition of the token-reward habit in the cat. Each of four animals is trained to press a string which releases a rubber ball into its cage. The ball in turn is rolled into a chute which removes a barrier to the food pan. The animals quickly learn the primary and secondary habits. For a few trials one cat takes the balls directly from the magazine. The bewilderment of this animal when an accidental, repetitive pressing of the string releases a flood of balls into the cage is neatly shown.

Gordon (**109**), working with free-ranging, golden-mantled ground squirrels, obtained some rare pictures of these little animals in puzzle-box and string situations. Peanuts are suspended out of reach, and the film shows the repeated and rather ingenious attacks on the problems by the squirrels. Although the film has not been carefully edited or titled, the nature of each learning task is deduced easily from the pictures.

String-pulling and a monkey's use of tools are delineated in two films by Warden and Gilbert (**240**) and Warden (**239**). The first picture illustrates tool-using on single and multiple platforms, while the second film demonstrates the use of rakes for reaching food. It is shown that the monkey employs a short rake to get another one long enough to pull in the food. This procedure is continued until eight rakes in series are used by the animal.

The film by Weinstein (**242**) shows two rhesus monkeys sorting out red and blue stimulus objects in response to a symbol for red and a symbol for blue, respectively. A diverse assortment of stimulus objects is used involving eight variables: pattern, size, brightness, saturation, number, dimension, background, and configuration. The pictures and the accompanying sound commentary fully describe the training sequence. The responses of the animals have an important bearing upon the operational distinction between a sign and a symbol. The related film by Harlow (**117**) depicts the reactions of monkeys to stimuli having multiple sign values.

The film by Elder (**88**) demonstrates that a chimpanzee may consistently fail to open husked coconuts without tools. After watching another chimpanzee break the nut by pounding it on the floor, however, the first animal may then solve the problem immediately.

The use of mirror, slot, and punchboard mazes in studying the learning of children is illustrated in the film by Jones (**139**). A rat's progress in mastering a "U" maze is exhibited in a demonstrational

film by Freeman (**94**). Warden and Gilbert (**240**) show a white rat learning both elevated and Warner-Warden mazes.

The songs of canaries reared in isolation and stimulated with tones of different vibratos are recorded on a sound film by Metfessel (**200**). This picture also exhibits a bird that whistles a popular tune.

Short films dealing with selected aspects of the learning process have been made by Ellis (**89**), French (**96**), Hudson (**127**), Tolman (**229**), Tolman and Crannell (**230**), and Young (**251**).

Perception

(*a*) *Visual*

Two films on visual perception have been prepared by Gilbert (**105**, **104**) for instruction in elementary psychology. The topics covered in the first picture are the phi phenomenon, optical illusions, brightness constancy, eye-movements in reading, and perception span. A series of numbers at the end of the film serve as material for determining the digit span. The second picture is photographed in natural color and covers the simple demonstrations of color mixture, retinal perimetry, color-blindness, and after-images, the last being illustrated with charts and diagrams. A Harvard film (**57**) reveals through high-speed motion pictures action which normally is beyond the limits of human perception. Interesting examples include the synchronism of muscle groups and the wings of a hummingbird in flight.

The color perception of bees is demonstrated in a color film by Ilse (**134**). After the bees have been fed on blue squares of paper they are able to discriminate the blue from gray, red, yellow, and green, but are confused by violet and purple. The experimental procedure is nicely shown in the film, but the color rendition is mediocre and uneven.

(*b*) *Auditory*

Dallenbach (**83**) has photographed the performance of blind and blindfolded sighted subjects in seven series of experiments on the perception of obstacles at a distance. By carefully varying the situation it is shown that the perceptual cues are basically aural.

(*c*) *Reading*

The recording and controlling of eye-movements in reading is exhibited in a film by Holland (**126**). Hamilton (**116**) presents some

suggestions for reading proficiency along with eight simple exercises for increasing reading speed. The best series of training films for reading have been produced by Dearborn and Anderson (**84**). More than 25 phrase-reading exercises have been prepared in which the phrases are presented successively across the screen. The perceptual span, the direction of eye-movements, and the speed of presentation are thus controlled. This technique appears to present numerous possibilities for the resourceful teacher and clinician.

Some relationships among reading, writing, and handedness are exhibited in a picture by Link, Hossack, and Beck (**165**). The first part of the film attempts to show by selected examples that mirror-writing with the left hand is comparable to normal script with the right hand. The point is made that mirror-script probably has its origin in the spontaneous scribblings of early childhood. Later sections of the picture exhibit free mirror-script in an alcoholic and a hypnotic subject. The film closes with examples of ancient and modern scripts that are written from left to right, right to left, and up and down. This picture, which was produced entirely by students, contains imperfections in both content and composition.

Tests, Guidance, and Educational Problems

Tests and Test Performance

The administration of the short form of the New Stanford-Binet Scale is demonstrated with a 13-year-old boy in the talking film by Freeman (**95**). The reactions of the youngster are such as to suggest that pretest coaching had occurred, perhaps to facilitate the recording of the sound picture. A silent film by Gilbert and Garrett (**106**) shows the administration of Form L to a 5-year-old child. Only the tests passed are shown, starting from 4 years and running up to the 7-year level. "Close-ups" in parts of the film help to reveal the nature of the test materials. Titles explain the scoring standards and the calculation of the IQ.

The use of standard performance tests in examining both normal and feeble-minded children is demonstrated in a silent film distributed by the University of Minnesota (**50**). A picture by Werner (**243**) shows a new marble board test for analyzing visuomotor performance. The film by Goldstein and Scheerer (**108**) shows the use of the Kohs models for detecting impairment of abstract behavior in patients suffering from disturbance of cortical

function. Modifications of the original test are demonstrated which render abstraction from size or figure unnecessary.

A film by Bayley (**70**) is designed for use with students of child development in order to familiarize them with the methods used in securing anthropometric measurements on young children. The procedures of taking 14 different measurements are shown, identified by captions. In addition there are illustrations of children with different body-builds, a chart showing curves for two children who grew at different rates, and a pictorial sequence of one child showing changes from 2 to 10 years of age. The film, *When Bobby Goes to School* (**64**), gives an elementary account of the various tests that constitute a physical examination. For no good reason, this film may be borrowed only with the approval of the local county medical society.

Vocational Guidance

An overview of occupations and aptitudes, arranged primarily for high school students, is provided in a well-edited, talking, Coronet film (**244**). Six aptitudes, clerical, mechanical, musical, artistic, social, and scholastic, are discussed and illustrated briefly. The testing sequences in the film are sketchy, and the tests are not identified. This film will serve best as an introduction to the field. The film by Ford (**93**) demonstrates the use of seven tests of motor aptitude with college subjects possessing mediocre and exceptional abilities. Some comparisons in assembly work also are made.

An ambitious film-production program is being carried on by Vocational Guidance Films, Inc. The complete four-year schedule calls for 64 reels of talking film, 61 of which are to be devoted to the presentation of factual information about fields of employment. The three other reels will contain advice on how to find and hold a job. Already available is the initial reel, *Finding Your Life Work* (**232**), and four pictures dealing with the fields of journalism (**233**), radio and television (**234**), automotive service (**231**), and woodworking (**235**). In the first film the candidate for a job is advised to appraise his intelligence, special aptitudes, educational record, interests, accomplishments, and social and economic assets. He is urged to get a broad view of many occupations, to make full use of the vocational departments in high school, and not to believe those people who say that there are no longer any vocational opportunities. The occupational films to be released in the near future deal with the fields of general farming, forestry, drafting,

retail selling, engineering, nursing, and accountancy. The continuity, organization, and sound-recording of the films are excellent.

The purpose and accomplishments of the NYA program are reviewed in the film, *Jobs, Not Handouts* (**39**). The work of the General College of the University of Minnesota in vocational orientation is outlined in the picture, *Is There Room for Us?* (**38**). *I Want a Job* (**36**) is an excellent training film for young job seekers. A number of interviews are presented in the talking picture, and one can see in a concrete way why certain applicants are not hired.

Educational Theory and Practice

The documentary films, *And So They Live* (**90**) and *The Children Must Learn* (**238**), bring into sharp relief the hiatus between education and the needs of the people in two rural communities typical of many throughout the United States. Pictures and commentary describe families living on land that is poor, their children suffering from lack of proper diet and adequate clothing. Resources immediately available for better living remain untapped because the people have never been taught how to use them. Meanwhile, in the schools the young people read from Chaucer, are taught about the lives of children in foreign lands, and learn from their readers how to save money and make good investments. The difference between the two films is chiefly one of emphasis. *And So They Live* is the longer film and gives a fuller documentation of the problems of the community and family life. *The Children Must Learn* contains a direct appeal to bring the school program into line with community programs. The film is distinguished by its use of folk music as a running accompaniment.

The progress of Negro education in the South from rural one-room schools to modern universities is graphically shown in the documentary film, *One-tenth of a Nation* (**110**). The film contains a plea for further extension of educational facilities for the Negro.

Progressive education in practice is surveyed in a number of films (**17, 45, 86, 111, 237**). Progressive educational theories are shown being tested in *Life's* summer camps (**43**). An attempt is made to relate all activities to the needs of the child. In an interview at the end of the picture, John Dewey expresses his approval of the project.

The American Friends Service Committee has produced a film (**69**) which illustrates the system of work camps established

to give college students and young business and professional people a chance to work in areas throughout the United States. From their contacts they can get firsthand knowledge of America's economic problems.

The plan of English and Scottish public education is well portrayed in a triad of talking films (**10**, **11**, **12**). The emphasis placed upon the value of the public nursery school is a healthy contrast to traditional American practice.

The preschool program, as it is carried on in the Iowa Child Welfare Research Station, is depicted fully in *Preschool Adventures* (**223**). Sympathetic understanding, extensive opportunities for constructive play, and rapid socialization are points which are stressed particularly in the picture.

Abnormal Behavior

Hypnosis and Aphasia

A film with far-reaching implications is *Hypnotic Induction of Color Vision Anomalies*, by Harriman (**119**). By appropriate posthypnotic suggestions in a deep trance state the subject is rendered color-blind in the subsequent waking state for green and then red. The reactions on the Ishihara and Holmgren tests are consistent with the suggestions. This picture is well suited for instruction in elementary psychology and will help to convince skeptics of the genuineness of hypnotic phenomena. At the same time, however, the instructor may find himself taxed in offering an explanation of the phenomena which will satisfy the students. A second film by Harriman (**118**) depicts a subject in a deep trance who engages in cryptic automatic writing. Upon awakening he is unable to decipher the script. The assumption is that he was a second personality during the interval while he wrote and that he becomes a third personality in the period of posthypnotic somnambulism. By means of a conditioned-response technique, the normal personality is restored, whereupon the writing is deciphered.

An interesting case of nominal aphasia is presented in the talking film by Leighton and Lidz (**154**). The aphasia appeared simultaneously with a slight hemiplegia, but remained after the latter had disappeared. The difficulty that the subject experiences in selecting words is clearly apparent.

Experimental Neurosis

The technique of producing experimental neuroticism in the

rat is shown, step by step, in the well-known film by Maier and Glaser (**184**). In a later picture, Maier (**182**) develops the thesis that neurotic behavior is one of the many possible solutions to a difficult conflict situation. He shows that if the rat is allowed to substitute certain "escape" reactions, such as climbing on top of the starting box, jumping to the near wall, or clinging to the edge of the apparatus, the neurotic pattern is held in abeyance. When these "abortive" reactions are prevented, the neurotic attack appears with its stereotyped running, jumping, convulsions, and muscular passivity. Additional films dealing with aberrant behavior in rats have been made by Cook (**82**), Fields (**91**), and Maier and Sacks (**185**).

Difficult differentiation of signals for food produces chronic nervous disturbances in some dogs. The film by Gantt and Leighton (**97**) shows the reactions of one animal in which the anxiety-like state had persisted for seven years. Shift of the animal from laboratory to country abolished most of the symptoms, but they reappeared when the dog was returned.

A series of four films by Masserman (**195**, **196**, **197**, **198**) outlines the induction and elicitation of experimental neuroses in cats. Conditioned feeding reactions are disrupted by a blast of air across the food box as the animal begins to eat. A few repetitions of this situation provoke the neurosis in which the cat, among other things, trembles or hides, refuses food, and shows marked startle to slight stimuli. Direct stimulation of the hypothalamus fails to produce reactions in any way like the conditioned emotional or neurotic symptoms. Furthermore, the simultaneous presentation of a conditioning signal with the sham rage pattern evoked by direct stimulation of the hypothalamus does not result in a "learning" of the sham pattern, even after hundreds of trials.

Psychoses and Allied States[4]

The marked irregular movements of the face and extremities in Huntington's chorea are delineated in the film by Rossman (**210**). The film by Page (**207**) reviews the common symptoms of schizophrenia as they are exhibited by patients in the average public asylum. Although the facial expression in most subjects is concealed by a mask, the picture shows such reactions as automatism, negativism, waxy flexibility, silliness, and volubility re-

[4] Several psychiatric films have been omitted from this section because no arrangements have been made for their distribution to nonmedical groups.

leased by delusions and hallucinations. This picture is essentially a cinematic chronicle and makes no attempt to explain the psychological significance of the patient's symptoms. The companion picture (**208**), which deals with the treatment of mental disorders, shows what a lay visitor to a psychopathic hospital might see of hydrotherapy, fever treatment, and the use of insulin, metrazol, and divers sedatives. The final scenes of recreational activities in a psychiatric hospital are somewhat depressing. One member of a preview panel remarked after seeing this film: "No wonder the remission rate is low!"

The Johns Hopkins series of psychiatric films aims to portray in detail the reactions of each psychotic patient. Two silent films (**150**, **149**) are devoted to the contrasting motility exhibited in schizophrenia. In the first case the pattern is one of stuporous catatonia, while in the second the actions are stereotyped and ritualistic. A pair of talking films (**151**, **152**) vividly demonstrate delusions and hallucinations in senility and delusions arising from a head injury. A rare type of syncope is exhibited in the film by Leighton and Rosen (**155**).

Recent modifications of convulsive shock therapy in which the paroxysms are softened with curare and quinine methochloride are clearly revealed in the color film by Bennett and Cash (**74**). Bennett (**71**) also shows recent progress in the use of convulsive therapy with affective psychotic states. In another film Bennett (**72**) illustrates the duties of a nurse in a modern psychiatric hospital.

Feeble-mindedness

One of the finest 16-millimeter films ever made deals with the care of the feeble-minded. This picture, which was photographed at Woodbine Colony by Bugbee (**78**), presents the historical changes in attitude toward the feeble-minded and briefly sketches the early efforts of Pinel and Esquirol. The main portion of the film gives a subtle portrayal of the inmate's position in a modern feeble-minded colony. The continuity and color in this film are outstanding. Three other films on the feeble-minded have been prepared by the Visual Education Service, University of Minnesota. The first film (**37**) portrays the daily activities and training program in the school for the feeble-minded at Faribault. The second picture (**24**) treats the subject of the feeble-minded from the standpoint of pathology. The introduction mentions briefly the possible organic conditions causing feeble-mindedness. A half-reel sequence

on performance testing serves to differentiate the morons, imbeciles, and idiots. The main body of the film is concerned with describing the eight major pathological groups: hypertelorism, oxycephalus, microcephaly, hydrocephalus, cretinism, mongolism, epilepsy, and cerebral palsy. The third film (**50**) deals with performance testing and compares the reactions of feeble-minded and normal youngsters on the manikin, Seguin formboard, Knox cube, diamond, and memory tests.

Strauss and Werner (**226**) demonstrate deficiencies in counting and localizing the fingers by some feeble-minded boys. Mitrano (**201**) attempts to show that an aphasic child, compared with a feeble-minded youngster, shows more discrepancies between verbal and manipulative tests, on the one hand, and the language development and social competence, on the other. The film by Allen (**1**) traces the mental development of a young man who had been isolated for 16 years by epileptic seizures.

Educational opportunities for retarded and handicapped children are reviewed in a pair of silent films (**4**, **65**).

Training of the Blind and Deaf

Five films show special techniques for teaching blind children how to read and write (**6**, **54**, **55**), mental-hygiene work with the blind (**22**), and the way the blind are taught to avail themselves of the help of dogs (**250**). The last picture is an unusual document in showing both the training of the "Seeing Eye" dogs and the gradual acquisition of confidence in the dogs by their blind companions.

The education of deaf children and adults is described in two films (**8**, **26**) which were produced by schools for the deaf.

Delinquency and Crime

The catalog of Teaching Film Custodians (**274**) lists more than 20 fictional excerpts that are edited to show the folly of crime. The efforts of the Federal Bureau of Investigation in tracking down criminals are presented graphically in a film entitled *You Can't Get Away With It* (**68**). Rehabilitative work in a federal prison is well portrayed in a March of Time film (**14**). The handling of juvenile delinquency is portrayed in four pictures (**3**, **5**, **29**, **59**).

Borderline Phenomena

A photographic study of Negro religious ecstasy with accom-

panying sound-recording has been made by Brandt, Belo, and Mead (**76**). The picture shows the behavior of the congregation and its leaders and reviews various phases of the sanctified church service.

A comparison of the superstitions of colonial days and those that are believed today reveals a close similarity, as shown in excerpts from the feature picture, *Maid of Salem* (**138**). Another film (**66**) portrays the pervasiveness of superstition among primitive peoples.

The premonitions and predictions of Nostrodamus, born in 1503, are reviewed in a film (**46**) by the same name. The escape from death, possibly by mental telepathy, is presented in the picture, *What Do You Think?* (**63**). Handwriting and what it means to the graphologist is outlined in the film on *Personality and the Pen* (**51**).

Documentary Films

A large number of documentary films are being produced currently. These pictures are fact films with a social story to tell. Some noteworthy examples include *The River* (**166**), *The Spanish Earth* (**135**), *The Four Hundred Million* (**136**), *United Action* (**187**), *Youth of a Nation* (**144**), *Valley Town* (**236**), and *Machine : Master or Slave* (**206**). Undoubtedly, the present international crisis will stimulate the production of documentary pictures on propaganda and war. For a survey of war films which are currently available for classroom use, the reader should consult the catalogs, *Living Films* (**254**), *March of Time* (**256**), *Films on War and American Policy* (**252**), and *Films of Distinction* (**266**). For a detailed portrayal of war at its worst, *The World in Flames* (**67**) is a film that has no equal. The facial expression of Mussolini as he addresses a Fascist gathering and the scenes of a French mob breaking and hurling bricks are outstanding photographic "scoops."

A Suggested Group of Films for Courses in General Psychology

1. Development of Behavior (**30, 129, 132, 224**).
2. Animal and Infant Behavior (**70, 147, 148, 177, 178**).
3. Response Mechanism (**13, 15, 33, 34, 73, 214**).
4. Learning (**109, 195, 213, 216, 217, 239, 242**).
5. Perception (**104, 105**).

6. Tests, Guidance, and Educational Problems (**36**, **93**, **106**, **223**, **238**, **244**).
7. Abnormal Behavior (**74**, **78**, **97**, **119**, **149**, **151**, **184**, **196**).
8. Social Behavior (**67**, **160**, **202**, **203**).

BIBLIOGRAPHY

Films[5]

1. ALLEN, D. T. The development of Eugene, a 23-year-old boy isolated by 16 years of epileptic seizures. Cincinnati: Children's Hospital, 1940. 700 ft., silent, monochrome, sale price on request.
2. ANON. Beginnings of photography. New York: W. O. Gutlohn, Inc., 35 W. 45th St., 1940. 400 ft., sound, monochrome, $36 sale, $1.50 rental.
3. ANON. Berkshire Industrial Farm. New York: Berkshire Industrial Farm, 101 Park Ave., 1938. 400 ft., silent, monochrome, free loan.
4. ANON. Binet class activities. Newark: Department of Library and Visual Aids, Board of Education, 1939. 400 ft., silent, monochrome, $2.00 rental.
5. ANON. Boy in court. New York: National Probation Association, 1790 Broadway, 1940. 400 ft., sound, monochrome, $25 sale.
6. ANON. Braille and sight conservation classes. Newark: Department of Library and Visual Aids, Board of Education, 1939. 700 ft., silent, monochrome, $3.00 rental.
7. ANON. Brain and nervous system. New York: Carter Cinema Producing Corp., 551 Fifth Ave., 1937. 1600 ft., silent, monochrome, $8.00 rental or $2.00 per reel.
8. ANON. Bruce Street School for the Deaf. Newark: Department of Library and Visual Aids, Board of Education, 1939. 400 ft., silent, monochrome, $2.00 rental.
9. ANON. By experience I learn. Washington: Children's Bureau, 1938. 700 ft., silent, monochrome, free loan.
10. ANON. Children at school. New York: Association of School Film Libraries, 9 Rockefeller Plaza, 1937. 800 ft., sound, monochrome, $80 sale, $4.00 rental.
11. ANON. The children's story. New York: Association of School Film Libraries, 9 Rockefeller Plaza, 1938. 800 ft., sound, monochrome, $80 sale, $4.00 rental.
12. ANON. Citizens of the future. New York: Visual Library, 1600 Broadway, 1935. 400 ft., sound, monochrome, $50 sale.
13. ANON. Color changes in fish and squids. New Brunswick: Rutgers Films, New Jersey Hall, Rutgers Univ., 1939. 400 ft., silent, color, $60 sale, $5.00 rental.
14. ANON. Crime and prisons. New York: Association of School Film Libraries, 9 Rockefeller Plaza, 1940. 400 ft., sound, monochrome, $40 sale.
15. ANON. Curves of color. Schenectady: General Electric Co., Visual Instruction Section, 1941. 400 ft., sound, color, free loan.

[5] Many films may be obtained from state departments of visual instruction as well as from the national libraries listed in the bibliography.

16. ANON. Development of the fertilized rabbit's ovum. Rochester: Eastman Classroom Films, 1938. 400 ft., silent, monochrome, $24 sale.

17. ANON. Dynamic education. New York: Progressive Education Association, 310 W. 90th St., 1937. 360 ft., silent, monochrome, sale price on request.

18. ANON. Evolution of the motion picture. New York: Bell & Howell, 30 Rockefeller Plaza, 1940. 1000 ft., sound, monochrome, $72 sale, $3.00 rental.

19. ANON. External diseases of the eye. Albany: Arthur J. Bedell, 344 State St., 1939. 800 ft., silent, monochrome, sale price on request.

20. ANON. Eyes, advanced. Rochester: Eastman Classroom Films, 1941. 400 ft., silent, monochrome, $24 sale.

21. ANON. Eyes, elementary. Rochester: Eastman Classroom Films, 1941. 400 ft., silent, monochrome, $24 sale.

22. ANON. Eyes to the blind. New York: Instructional Cinema Service, 130 W. 46th St., 1939. 400 ft., silent, monochrome, $1.50 rental.

23. ANON. Eyesight. New York: Instructional Cinema Service, 130 W. 46th St., 1939. 400 ft., silent, monochrome, $1.50 rental.

24. ANON. The feeble-minded. Minneapolis: Visual Education Service, Univ. Minnesota, 1940. 1600 ft., sound, monochrome, $170 sale.

25. ANON. Fertilization. Rochester: Eastman Classroom Films, 1940. 275 ft., silent, monochrome, $12 sale.

26. ANON. Gallaudet College. Washington: Roy J. Stewart, 1008 Park Rd., 1939. 800 ft., silent, monochrome, free loan.

27. ANON. Garden spiders. New York: Edited Pictures System, 339 W. 42nd St., 1938. 360 ft., sound, monochrome, $30 sale.

28. ANON. The gift of life. New York: American Social Hygiene Association, Division of Public Information, 1938. 1600 ft., silent, monochrome, $108 sale.

29. ANON. Greatest crime. Washington: U. S. Department of Commerce, Motion Picture Division, 1937. 400 ft., sound, monochrome, free loan.

30. ANON. How animal life begins. New York: American Film Center, 45 Rockefeller Plaza, 1939. 300 ft., sound, monochrome, $10 sale.

31. ANON. How life begins. New York: Carter Cinema Producing Corporation, 551 Fifth Ave., 1938. 1440 ft., silent, monochrome, $150 sale, $8.00 rental.

32. ANON. How motion pictures move and talk. Chicago: Bell & Howell, 1801 Larchmont Ave., 1939. 396 ft., sound, monochrome, $32 sale, $1.50 rental.

33. ANON. How we hear. New York: Knowledge Builders, 130 W. 46th St., 1939. 400 ft., sound, monochrome, $40 sale, $2.00 rental.

34. ANON. How we see. New York: Knowledge Builders, 130 W. 46th St., 1939. 400 ft., sound, monochrome, $40 sale, $2.00 rental.

35. ANON. The human eye. New York: Carter Cinema Producing Corporation, 551 Fifth Ave., 1938. 400 ft., silent, monochrome, $1.50 rental.

36. ANON. I want a job. Los Angeles: Forum Films, Inc., 1941. 1000 ft., sound, color, $100 sale.

37. ANON. Institutional training. Minneapolis: Visual Education Service, Univ. Minnesota, 1940. 400 ft., silent, monochrome, $36 sale, $1.50 rental.

38. ANON. Is there room for us? Minneapolis: Visual Education Service, Univ. Minnesota, 1940. 800 ft., sound, monochrome, $75 sale, $3.00 rental.

39. ANON. Jobs, not handouts. Washington: National Youth Administration, 2145 C St., 1940. 400 ft., sound, color, free loan.
40. ANON. Judy's diary from morning until night. Washington: Children's Bureau, 1938. 800 ft., silent, monochrome, free loan.
41. ANON. Lenses and their uses. New York: Harmon Foundation, 140 Nassau St., 1940. 400 ft., silent, monochrome, $30 sale, $1.50 rental.
42. ANON. Life-story of the tadpole. New York: Visual Library, 1600 Broadway, 1936. 400 ft., sound, monochrome, sale price on request.
43. ANON. Life's summer camps. New York: Association of School Film Libraries, 9 Rockefeller Plaza, 1937. 360 ft., sound, monochrome, $40 sale.
44. ANON. Living world. New York: Carter Cinema Producing Corporation, 551 Fifth Ave., 1937. 1440 ft., silent, monochrome, $150 sale, $7.50 rental.
45. ANON. Modern schools at work. Springfield: Illinois Education Association 100 E. Edwards St., 1938. 960 ft., silent, monochrome, $60 sale.
46. ANON. Nostrodamus. New York: Teaching Films, Inc., 23 W. 43rd St., 1938. 400 ft., sound, monochrome, $5.00 rental.
47. ANON. Now I am two. Washington: Children's Bureau, 1939. 800 ft., silent, monochrome, free loan.
48. ANON. One-celled animals: protozoa. Rochester: Eastman Classroom Films, 1938. 768 ft., silent, monochrome, $42 sale.
49. ANON. Orthoptic training routine in the department of motor anomalies. New York: Conrad Berens, 111 E. 59th St., 1939. 800 ft., silent, monochrome, sale price on request.
50. ANON. Performance testing. Minneapolis: Visual Education Service, Univ. Minnesota, 1940. 900 ft., silent, monochrome, $72 sale, $3.00 rental.
51. ANON. Personality and the pen. New York: Teaching Film Custodians, 23 W. 43rd St., 1938. 400 ft., sound, monochrome, $5.00 rental.
52. ANON. Preventing blindness and saving sight. New York: National Society for the Prevention of Blindness, 50 W. 50th St., 1938. 800 ft., silent, monochrome, free loan.
53. ANON. The quintuplets. New York: W. O. Gutlohn, 35 W. 45th St., 1938. 500 ft., sound, monochrome, $35 sale, $3.00 rental.
54. ANON. Reading by sound and touch. New York: New York Public Library, 5th Ave. & 42nd St., 1940. 500 ft., silent, color, free loan.
55. ANON. Seeing fingers. New York: Y. M. C. A. Motion Picture Bureau, 347 Madison Ave., 1938. 900 ft., sound, monochrome, free loan.
56. ANON. Seeing how you see. Chicago: Chicago Film Laboratory, 666 Lake Shore Drive, 1938. 400 ft., silent, monochrome, rental and sale prices on request.
57. ANON. Seeing the unseen. Cambridge: Harvard Film Service, 1939. 400 ft., silent, monochrome, $25 sale, $1.00 rental.
58. ANON. Silver shadows. New York: Bell & Howell, 30 Rockefeller Plaza, 1940. 800 ft., sound, monochrome, $72 sale, $3.00 rental.
59. ANON. Social science. New York: Y. M. C. A. Motion Picture Bureau, 347 Madison Ave., 1937. 400 ft., silent, monochrome, $2.00 rental.
60. ANON. Sound. New York: Edited Pictures System, 330 W. 42nd St., 1938. 400 ft., sound, monochrome, $30 sale, $2.00 rental.
61. ANON. Vibratory motions and waves. New York: Edited Pictures System,

330 W. 42nd St., 1938. 720 ft., sound, monochrome, $75 sale, $4.00 rental.

62. ANON. Vorticella. New York: Edited Pictures System, 330 W. 42nd St., 1938. 288 ft., silent, monochrome, $25 sale.
63. ANON. What do you think? New York: Teaching Film Custodians, 23 W. 43rd St., 1938. 600 ft., sound, monochrome, $10 rental.
64. ANON. When Bobby goes to school. Evansville, Ind.: Mead Johnson & Co., 1940. 1200 ft., sound, monochrome, free loan.
65. ANON. Wickliffe Street School for children with multiple handicaps. Newark: Department of Library and Visual Aids, Board of Education, 1939. 400 ft., silent, monochrome, $2.00 rental.
66. ANON. Witch doctor's magic. New York: Teaching Film Custodians, 23 W. 43rd St., 1938. 700 ft., sound, monochrome, $10 rental.
67. ANON. The world in flames. New York: Films, Inc., 330 W. 42nd St., 1940. 1200 ft., sound, monochrome, rental price on request.
68. ANON. You can't get away with it. Chicago: Bell & Howell, 1801 Larchmont Ave., 1938. 1200 ft., sound, monochrome, $4.50 rental.
69. ANON. Youth faces facts. New York: Harmon Foundation, 140 Nassau St., 1940. 400 ft., silent, monochrome, $1.50 rental.
70. BAYLEY, N. Techniques of anthropometric measurements in young children. Berkeley: Department of Visual Instruction, Univ. California, 1941. 300 ft., silent, monochrome, $25 sale, $1.50 rental.
71. BENNETT, A. E. Convulsive shock therapy in affective psychoses. Bethlehem, Pa.: Psychological Cinema Register, 1457 Main St., 1939. 400 ft., silent, monochrome, $20 sale.
72. BENNETT, A. E. A nurse's day with the mentally ill in a psychiatric department of a general hospital. Omaha: Bishop Clarkson Memorial Hospital, 1938. 650 ft., silent, monochrome, rental price on request.
73. BENNETT, A. E., & CASH, P. T. The electroencephalogram. Bethlehem, Pa.: Psychological Cinema Register, 1457 Main St., 1941. 370 ft., silent, monochrome, $18.50 sale.
74. BENNETT, A. E., & CASH, P. T. Recent modifications of convulsive shock therapy. Bethlehem, Pa.: Psychological Cinema Register, 1457 Main St., 1941. 480 ft., silent, color, $72 sale.
75. BILLINGSLEA, F. Y. Emotionality, activity, curiosity, and persistence in the rat. Columbus: Ohio State Univ., 1941. 350 ft., silent, monochrome, free loan. (BILLINGSLEA, F. Y. The relationship between emotionality, activity, curiosity, persistence and weight in the male rat. *J. comp. Psychol.*, 1940, **29**, 315–325; The relationship between emotionality and various other salients of behavior in the rat. *J. comp. Psychol.*, 1941, **31**, 69–77.)
76. BRANDT, L., BELO, J., & MEAD, M. Negro religious ecstasy. New York: Department of Anthropology, Columbia Univ., 1940. 700 ft., sound, monochrome, sale price on request.
77. BRAY, A. Leaping through life. New York: Bray Pictures Corporation, 729 7th Ave., 1937. 400 ft., sound, monochrome, $40 sale, $2.00 rental.
78. BUGBEE, R. W. The least of these. Trenton: Department of Institutions and Agencies, State of New Jersey, 1937. 400 ft., silent, color, rental and sale prices on request.
79. CARLSON, A. J., & SWANN, H. G. Endocrine glands. Long Island City, N. Y.: Erpi Classroom Films, 1940. 400 ft., sound, monochrome, $40 sale. (*Psychol. Abstr.*, 1941, **15**, #1675.)

80. Carpenter, C. R. Behavior of free-ranging rhesus monkeys. State College: Department of Psychology, Pennsylvania State College, 1940. 400 ft., silent, color, $5.00 rental per week.

81. Carpenter, C. R. Photographic studies of gibbons and orangutans. New York: Columbia Univ. Library, 1938. 1600 ft., silent, monochrome, rental price on request.

82. Cook, S. W. "Experimental neurosis" in the white rat. Minneapolis: Department of Psychology, Univ. Minnesota, 1938. 200 ft., silent, monochrome, rental and sale prices on request.

83. Dallenbach, K. M. Experiments in "facial vision." Ithaca: Department of Psychology, Cornell Univ., 1941. 450 ft., silent, monochrome, sale price on request, $3.00 rental.

84. Dearborn, W. F., & Anderson, I. H. The Harvard films for the improvement of reading. Cambridge: Harvard Film Service, 1938. 15 films, 200 ft. each, silent, monochrome, $110 sale. (Dearborn, W. F., & Anderson, I. H. A new method for teaching phrasing and for increasing the size of reading fixations. *Psychol. Rec.*, 1937, **1**, 459–475; Controlled reading by means of a motion picture technique. *Psychol. Rec.*, 1938, **2**, 219–227; A sound motion-picture technique for teaching beginning reading. *Sch. & Soc.*, 1940, **52**, 367–369.)

85. DeLee, J. B. Injuries of the newborn. Chicago: J. B. DeLee Films, 5028 Ellis Ave., 1936. 400 ft., sound, monochrome, $40 sale, $2.50 rental.

86. Dick, L. School. New York: American Film Center, 45 Rockefeller Plaza, 1939. 700 ft., sound, monochrome, rental and sale prices on request.

87. Durden, F. V., & Smith, P. F. Development of the trout. New York: Visual Library, 1600 Broadway, 1938. 700 ft., silent, monochrome, rental and sale prices on request.

88. Elder, J. H. Imitation and the effect of dominance status on learning in chimpanzees. Madison: Department of Psychology, Univ. Wisconsin, 1938. 400 ft., silent, monochrome, rental and sale prices on request.

89. Ellis, W. D. Instruction in animal psychology. Tucson: Department of Psychology, Univ. Arizona, 1939. 300 ft., silent, monochrome, $25 sale. (Hamilton, J. A., & Ellis, W. D. Persistence and behavior constancy. *J. genet. Psychol.*, 1933, **42**, 140–153.)

90. Ferno, J., & Roffman, J. And so they live. New York: New York Univ. Film Library, 71 Washington Square, 1940. 850 ft., sound, monochrome, $4.00 rental.

91. Fields, P. E. A quantitative investigation of bodily changes induced in aberrant and normal rats by varying the difficulty of visual size discriminations. Delaware: Department of Psychology, Ohio Wesleyan Univ., 1940. 350 ft., silent, monochrome, rental and sale prices on request.

92. Fletcher, H. Life begins again. New York: Western Electric Co., 195 Broadway, 1940. 800 ft., sound, monochrome, free loan.

93. Ford, A. Motor aptitude tests and assembly work. Bethlehem, Pa.: Psychological Cinema Register, 1457 Main St., 1941. 500 ft., silent, monochrome, $25 sale.

94. Freeman, G. L. Animal learning. Chicago: College Film Center, 59 E. Van Buren St., 1938. 350 ft., silent, monochrome, $1.50 rental.

95. Freeman, G. L. Measurement of intelligence. Chicago: College Film Center, 59 E. Van Buren St., 1938. 550 ft., sound, monochrome, $3.00 rental.

96. French, J. W. Maze learning in goldfish. Bethlehem, Pa.: Psychological Cinema Register, 1457 Main St., 1941. 140 ft., silent, color, $15 sale. (*Psychol. Bull.*, 1941, **38**, 614.)

97. Gantt, W. H., & Leighton, A. H. Experimental "neurosis" in a dog. Bethlehem, Pa.: Psychological Cinema Register, 1457 Main St., 1939. 220 ft., silent, monochrome, $11 sale.

98. Gesell, A. Clinical case studies: developmental deviations. Series A. New Haven: Yale Clinic of Child Development, 1940. 700 ft., silent, monochrome, sale price on request.

99. Gesell, A. Individuality in infancy. New Haven: Yale Clinic of Child Development, 1939. 400 ft., silent, monochrome, sale price on request. (Gesell, A., & Ames, L. B. Early evidences of individuality in the human infant. *Sci. Mon., N. Y.*, 1937, **45**, 217–225.)

100. Gesell, A. The patterning of prone behavior in the human infant. New Haven: Yale Clinic of Child Development, 1939. 400 ft., silent, monochrome, sale price on request. (Ames, L. B. The sequential patterning of prone progression in the human infant. *Genet. Psychol. Monogr.*, 1937, **19**, 409–460.)

101. Gesell, A. Series of 24 edited normative films: ball behavior, 40–56 wks., 100 ft.; bell behavior, 16–56 wks., 125 ft.; cup behavior, 12–36 wks., 75 ft.; cup and cubes, 32–56 wks., 90 ft.; cup and spoon, 40–56 wks., 200 ft.; consecutive cubes, 12–56 wks., 300 ft.; dangling ring, 4–28 wks., 175 ft.; form board, 20–56 wks., 225 ft.; massed cubes, 16–56 wks., 200 ft.; mirror, 40–56 wks., 75 ft.; paper and crayon, 36–56 wks., 80 ft.; pellet, 12–56 wks., 100 ft.; pellet in bottle and pellet beside bottle, 40–52 wks., 135 ft.; performance box, 40–52 wks., 110 ft.; prone, 4–56 wks., 110 ft.; rattle, 4–28 wks., 110 ft.; ring and string, 28–56 wks., 100 ft.; ring, string, and bell, 32–56 wks., 60 ft.; sitting, 4–52 wks., 225 ft.; spoon, 16–56 wks., 60 ft.; stairs, 40–56 wks., 40 ft.; standing, 4–60 wks., 225 ft.; supine, 4–40 wks., 65 ft.; tower building, 44–56 wks., 30 ft. New Haven: Yale Clinic of Child Development, 1939. All silent, monochrome, sale prices on request. (Gesell, A. Cinemanalysis: a method of behavior study. *J. genet. Psychol.*, 1935, **47**, 1, 3–16. Gesell, A., *et al.* An atlas of infant behavior. New Haven: Yale Univ. Press, 1934. Vol. I. Gesell, A., & Thompson, H. Infant behavior: its genesis and growth. New York: McGraw-Hill, 1934; Psychology of early growth, including norms of infant behavior. New York: Macmillan, 1938.)

102. Gesell, A. Technical reel showing procedures for developmental examinations. New Haven: Yale Clinic of Child Development, 1939. 400 ft., silent, monochrome, sale price on request. (Gesell, A., Thompson, H., & Amatruda, C. S. The psychology of early growth. New York: Macmillan, 1938.)

103. Gesell, A. The tonic neck reflex in the human infant. New Haven: Yale Clinic of Child Development, 1939. 125 ft., silent, monochrome, sale price on request.

104. Gilbert, G. M. Color vision. New York: Warden & Gilbert Films, Columbia Univ., 1938. 200 ft., silent, color, $30 sale. (*Psychol. Abstr.*, 1939, **13**, #1248.)

105. Gilbert, G. M. The experimental psychology of vision. New York: Warden & Gilbert Films, Columbia Univ., 1938. 380 ft., silent, monochrome, $23 sale. (*Psychol. Abstr.*, 1939, **13**, #1247.)

106. Gilbert, G. M., & Garrett, H. E. Testing the IQ. New York: Warden & Gilbert Films, Columbia Univ., 1940. 375 ft., silent, $23 sale. (*Psychol. Abstr.*, 1940, **14**, #6245.)
107. Girden, E. The dissociative effects of curare. Bethlehem, Pa.: Psychological Cinema Register, 1457 Main St., 1939. 280 ft., silent, monochrome, $14 sale.
108. Goldstein, K., & Scheerer, M. Impairment of abstract behavior manifested in a test performance. Medford, Mass.: Tufts College, 1940. 400 ft., silent, color, $50 sale, $10 rental. (Bolles, M., & Goldstein, K. A study of the impairment of "abstract behavior" in schizophrenic patients. *Psychiat. Quart.*, 1938, **12**, 42–65).
109. Gordon, K. Learning in golden-mantled ground squirrels. Corvallis: Department of Zoology, Oregon State Agricultural College, 1936–1938. 800 ft., silent, monochrome, sale price on request.
110. Greene, F. One-tenth of a nation. New York: American Film Center, 45 Rockefeller Plaza, 1940. 1000 ft., sound, monochrome, rental and sale prices on request.
111. Hadley, A. M. Glimpses of education in western Massachusetts. Geneva, N. Y.: Allan M. Hadley, Hobart College, 193?. 600 ft., sound, monochrome, sale price on request.
112. Halstead, W. C. Objective methods for the analysis of human brain cases. 1. A case of parietal lobectomy. Chicago: Univ. Chicago, 1937. 400 ft., silent, monochrome, $5.00 rental.
113. Halstead, W. C. Objective methods for the analysis of human brain cases. 2. Charting the visual fields with direct control of ocular fixation. Chicago: Univ. Chicago, 1938. 400 ft., silent, monochrome, $5.00 rental. (Halstead, W. C. A method for the quantitative recording of eye movements. *J. Psychol.*, 1938, **6**, 177–180.)
114. Halstead, W. C. Objective methods for the analysis of human brain cases. 3. Social behavior following cerebral lobectomy. Chicago: Univ. Chicago, 1938. 400 ft., silent, monochrome, $5.00 rental.
115. Halstead, W. C. Objective methods for the analysis of human brain cases. 4. Response equivalence in a case of spastic quadriplegia. Chicago: Univ. Chicago, 1938. 250 ft., silent, monochrome, $5.00 rental.
116. Hamilton, J. California reading film. Berkeley: Department of Visual Instruction, Univ. California, 1939. 700 ft., silent, monochrome, $28 sale, $1.50 rental.
117. Harlow, H. F. Responses by monkeys to stimuli having multiple sign values. Madison: Department of Psychology, Univ. Wisconsin, 1941. 550 ft., silent, color, sale price on request, $3.00 rental.
118. Harriman, P. L. Cryptic automatic writing by a multiple personality. Bethlehem, Pa.: Psychological Cinema Register, 1457 Main St., 1941. 310 ft., silent, monochrome, $15.50 sale.
119. Harriman, P. L. Hypnotic induction of color vision anomalies. Bethlehem, Pa.: Psychological Cinema Register, 1457 Main St., 1940. 465 ft., silent, color, $69 sale. (Erickson, M. H. The induction of color blindness by a technique of hypnotic suggestion. *J. genet. Psychol.*, 1939, **20**, 61–89. Grether, W. F. A comment on "the induction of color blindness by a technique of hypnotic suggestion." *J. genet. Psychol.*, 1940, **23**, 207–210.)
120. Hewer, R. R., Durden, J. V., & Smith, P. F. Development of the tadpole.

New York: Visual Library, 1600 Broadway, 1937. 548 ft., sound, monochrome, sale price on request.

121. HILL, D. B. Before the baby comes. Chicago: Bell & Howell, 1801 Larchmont Ave., 1939. 400 ft., sound, monochrome, $36 sale, $1.50 rental.

122. HILL, D. B. The child grows up. Chicago: Bell & Howell, 1801 Larchmont Ave., 1940. 400 ft., sound, monochrome, $36 sale, $1.50 rental.

123. HILL, D. B. The first year. Chicago: Bell & Howell, 1801 Larchmont Ave., 1940. 400 ft., sound, monochrome, $36 sale, $1.50 rental.

124. HILL, D. B. Life of a healthy child. Chicago: Bell & Howell, 1801 Larchmont Ave., 1939. 400 ft., sound, monochrome, $36 sale, $1.50 rental.

125. HILL, D. B. Road to health and happiness. Chicago: Bell & Howell, 1801 Larchmont Ave., 1939. 400 ft., sound, monochrome, $36 sale, $1.50 rental.

126. HOLLAND, B. F. Recording and controlling eye movements in reading. Austin: B. F. Holland, Univ. Texas, 1939. 1000 ft., silent, monochrome, $70 sale, $3.00 rental.

127. HUDSON, B. B. One trial learning in rats. Berkeley: Department of Psychology, Univ. California, 1939. 200 ft., silent, monochrome, sale price on request.

128. HULIN, W. S., & MOORE, A. R. Coordination in starfish. Bethlehem, Pa.: Psychological Cinema Register, 1457 Main St., 1938. 360 ft., silent, monochrome, $18 sale. (MOORE, A. R. Injury, recovery and function in an aganglionic central nervous system. *J. comp. Psychol.*, 1939, **28**, 313–333.)

129. HUXLEY, J. S., & HEWER, H. R. Heredity in animals. New York: Visual Library, 1600 Broadway, 1937. 700 ft., sound, monochrome, sale price on request. (*Psychol. Abstr.*, 1938, **12**, #5858.)

130. HUXLEY, J. S., & HEWER, H. R. Heredity in man. New York: Visual Library, 1600 Broadway, 1937. 518 ft., sound, monochrome, sale price on request. (*Psychol. Abstr.*, 1938, **12**, #5859.)

131. HUXLEY, J. S., & HEWER, H. R. Paramecium. New York: Visual Library, 1600 Broadway, 1937. 800 ft., sound, monochrome, sale price on request.

132. HUXLEY, J. S., HEWER, H. R., & DURDEN, J. V. Development of the chick. New York: Visual Library, 1600 Broadway, 1937. 800 ft., sound, monochrome, sale price on request.

133. HUXLEY, J. S., HEWER, H. R., & DURDEN, J. V. From generation to generation. New York: Visual Library, 1600 Broadway, 1937. 810 ft., sound, monochrome, sale price on request.

134. ILSE, D. Experiments on the colour sense of insects. Bethlehem, Pa.: Psychological Cinema Register, 1457 Main St., 1938. 220 ft., silent, color, $30 sale.

135. IVENS, J. The Spanish earth. New York: Brandon Films, 1600 Broadway, 1937. 2000 ft., sound, monochrome, rental price on request.

136. IVENS, J., & FERNO, J. The four hundred million. New York: Brandon Films, 1600 Broadway, 1938–1939. 2000 ft., sound, monochrome, rental price on request.

137. JAMES, W. T. Experiments on behavior and its relation to physical form. Ithaca: Cornell Univ., 1941. 400 ft., silent, monochrome, sale price on request.

138. JESTER, R. Have times changed? New York: Films, Inc., 300 W. 42nd St., 1938. 400 ft., sound, monochrome, $1.50 rental.

139. JONES, H. E. Experimental studies of the learning process in children: II. Berkeley: Institute of Child Welfare, Univ. California, 1939. 400 ft., silent, monochrome, $30 sale. (JONES, H. E., & YOSHIOKA, J. G. Differential errors in children's learning on a stylus maze. *J. comp. Psychol.*, 1938, **25**, 463–480. BUEL, J. A stylus punchboard maze with automatic differential and cumulative response indicators. *J. genet. Psychol.*, 1939, **55**, 221–228.)

140. KAUFMAN, N. The ant city. New York: UFA Films, Inc., 729 7th Ave., 1937. 518 ft., sound, monochrome, $50 sale, $3.50 rental. (*Psychol. Abstr.*, 1939, **13**, #5633.)

141. KAUFMAN, N. Life of the bee. New York: UFA Films, Inc., 729 7th Ave., 1938. 600 ft., sound, monochrome, $50 sale, $3.50 rental.

142. KAUFMAN, N. Plant power. New York: UFA Films, Inc., 729 7th Ave., 1937. 473 ft., sound, monochrome, $50 sale, $3.50 rental.

143. KAUFMAN, N. Sensitivity of plants. New York: UFA Films, Inc., 729 7th Ave., 1938. 518 ft., sound, monochrome, $50 sale, $3.50 rental. (*Psychol. Abstr.*, 1939, **13**, #5635.)

144. KISSACK, R., & MOSKOVITZ, N. Youth of a nation. Washington: National Youth Administration, 2145 C St., 1939. 700 ft., sound, monochrome, rental price on request.

145. LAIRD, D. How we get to be human. Hamilton, N. Y.: Colgate Univ., 1937. 1200 ft., silent, monochrome, price on request. (*Psychol. Abstr.*, 1938, **12**, #1699.)

146. LEGG, S. Mites and monsters. New York: W. O. Gutlohn, 35 W. 45th St., 1938. 600 ft., sound, monochrome, $72 sale, $3.00 rental.

147. LEGG, S. Monkey into man. New York: W. O. Gutlohn, 35 W. 45th St., 1938. 504 ft., sound, monochrome, $72 sale, $3.00 rental.

148. LEGG, S., & SPICE, E. Fingers and thumbs. New York: W. O. Gutlohn, 35 W. 45th St., 1938. 650 ft., sound, monochrome, $4.00 rental.

149. LEIGHTON, A. H. Athetoid gestures in a deteriorating parergasic (schizophrenic). Bethlehem, Pa.: Psychological Cinema Register, 1457 Main St., 1939. 180 ft., silent, monochrome, $9.00 sale.

150. LEIGHTON, A. H. Catatonic behavior in a deteriorated parergasic (schizophrenic) patient. Bethlehem, Pa.: Psychological Cinema Register, 1457 Main St., 1938. 170 ft., silent, monochrome, $8.50 sale.

151. LEIGHTON, A. H. Delusions and hallucinations in a senile setting. Bethlehem, Pa.: Psychological Cinema Register, 1457 Main St., 1939. 175 ft., sound, monochrome, $14 sale.

152. LEIGHTON, A. H. Paranoid state and deterioration following head injury. Bethlehem, Pa.: Psychological Cinema Register, 1457 Main St., 1939. 382 ft., sound, monochrome, $30.50 sale.

153. LEIGHTON, A. H. A parergasic reaction (schizophrenia) in a person of low intelligence. Bethlehem, Pa.: Psychological Cinema Register, 1457 Main St., 1939. 550 ft., sound, monochrome, $44 sale.

154. LEIGHTON, A. H., & LIDZ, T. A case of aphasia. Bethlehem, Pa.: Psychological Cinema Register, 1457 Main St., 1939. 513 ft., sound, monochrome, $41 sale.

155. LEIGHTON, A. H., & ROSEN, V. H. Carotid sinus syndrome. Bethlehem, Pa.: Psychological Cinema Register, 1457 Main St., 1940. 360 ft., silent, monochrome, $18 sale.

156. LEWIN, K. The child and the field forces. Iowa City: Department of Visual

Education, State Univ. Iowa, 1929. 415 ft., silent, monochrome, $23 sale.

157. LEWIN, K. Field forces as an impediment to a performance. Iowa City: Department of Visual Education, State Univ. Iowa, 1929. 392 ft., silent, monochrome, $22 sale.

158. LEWIN, K. Walking upstairs for the first time. Iowa City: Department of Visual Education, State Univ. Iowa, 1929. 151 ft., silent, monochrome, $9.00 sale.

159. LEWIN, K., & LEONARD, M. Level of aspiration in young children. Iowa City: Department of Visual Education, State Univ. Iowa, 1929. 412 ft., silent, monochrome, $25 sale.

160. LEWIN, K., LIPPITT, R., & WHITE, R. Experimental studies in social climates of groups. Iowa City: Department of Visual Education, State Univ. Iowa, 1939. 1200 ft., sound, monochrome, $95 sale, $7.00 rental from College Film Center. (BARKER, R., DEMBO, T., & LEWIN, K. Frustration and regression: an experiment with young children. *Univ. Ia Stud. Child Welf.*, 1941, **18**, xv–314. LEWIN K., LIPPITT, R., & WHITE, R. Patterns of aggressive behavior in experimentally created "social climates." *J. soc. Psychol.*, 1939, **10**, 271, 299. LIPPITT, R. An experimental study of authoritarian and democratic group atmospheres. *Univ. Ia Stud. Child Welf.*, 1940, **16**, 43–195.)

161. LEWIS, W. H., & GREGORY, P. W. Short film on early development of the rabbit egg. Baltimore: Department of Embryology, Carnegie Institution, 1938. 200 ft., silent, monochrome, $1.50 rental.

162. LEWIS, W. H., & GREGORY, P. W. Long film on the early development of the rabbit egg in vitro. Baltimore: Department of Embryology, Carnegie Institution, 1938. 1000 ft., silent, monochrome, $4.00 rental.

163. LEWIS, W. H., & HARTMAN, C. G. Early divisions (2–8 cells) of the living monkey egg in vitro. Baltimore: Department of Embryology, Carnegie Institution, 1938. 200 ft., silent, monochrome, $1.50 rental.

164. LINDSLEY, D. B., & SASSAMAN, W. H. "Voluntary" control of hair raising with associated autonomic phenomena. Bethlehem, Pa.: Psychological Cinema Register, 1457 Main St., 1940. 180 ft., silent, monochrome, $9.00 sale. (LINDSLEY, D. B., & SASSAMAN, W. H. Autonomic activity and brain potentials associated with "voluntary" control of the pilomotors. *J. Neurophysiol.*, 1938, **1**, 342–349.)

165. LINK, G., HOSSACK, B., & BECK, L. F. Mirror writing. Eugene: Department of Psychology, Univ. Oregon, 1940. 275 ft., silent, monochrome, rental and sale prices on request.

166. LORENTZ, P. The river. Washington: U. S. Office of Government Reports, 1937. 1200 ft., sound, monochrome, free loan.

167. LYMAN, R. Tests of vestibular function. Rochester: Eastman Classroom Films, 1936. 400 ft., silent, monochrome, $24 sale.

168. MCGRAW, M. B. Crawling and creeping: I & II. New York: Warden & Gilbert Films, Columbia Univ., 1939. I, 300 ft., silent, monochrome, $18 sale; II, 200 ft., silent, monochrome, $12 sale. (*J. genet. Psychol.*, 1941, **58**, 83–111.)

169. MCGRAW, M. B. Development of the plantar response in the human infant. New York: Warden & Gilbert Films, Columbia Univ., 1939. 180 ft., silent, monochrome, $12 sale.

170. McGraw, M. B. The Moro reflex. New York: Warden & Gilbert Films, Columbia Univ., 1939. 275 ft., silent, monochrome, $15 sale.

171. McGraw, M. B. Neural maturation as exemplified in the changing reaction of the infant to pin prick. New York: Warden & Gilbert Films, Columbia Univ., 1941. 300 ft., silent, monochrome, $18 sale. (*Child Develpm.*, 1941, **12**, 31–42; *Psychol. Abstr.*, 1941, **15**, #4072.)

172. McGraw, M. B. Neural maturation as exemplified in the reaching-prehensile behavior of the human infant. New York: Warden & Gilbert Films, Columbia Univ., 1941. 350 ft., silent, monochrome, $21 sale. (*J. Psychol.*, 1941, **11**, 127–141; *Psychol. Abstr.*, 1941, **15**, #4071.)

173. McGraw, M. B. Neural maturation as reflected in the development of antigravity musculature (sitting posture). New York: Warden & Gilbert Films, Columbia Univ., 1940. 250 ft., silent, monochrome, $15 sale. (*Psychol. Abstr.*, 1941, **15**, #601.)

174. McGraw, M. B. Neuromuscular development as reflected in the assumption of an erect posture. New York: Warden & Gilbert Films, Columbia Univ., 1941. 175 ft., silent, monochrome, $12 sale. (*Psychol. Abstr.*, 1941, **15**, #1559.)

175. McGraw, M. B. Neuromuscular development of the infant as exemplified in the achievement of erect locomotion. New York: Warden & Gilbert Films, Columbia Univ., 1939. 250 ft., silent, monochrome, $15 sale.

176. McGraw, M. B. Postural adjustments of the infant when held in an inverted position. New York: Warden & Gilbert Films, Columbia Univ., 1939. 175 ft., silent, monochrome, $12 sale.

177. McGraw, M. B. Quantitative measures of developmental processes in erect locomotion. New York: Warden & Gilbert Films, Columbia Univ., 1939. 600 ft. (2 reels, 300 ft. each), silent, monochrome, $35 sale or $18 per reel. (*Psychol. Abstr.*, 1939, **13**, #1137.)

178. McGraw, M. B. Reflex behavior of the newborn infant. New York: Warden & Gilbert Films, Columbia Univ., 1939. 160 ft., silent, monochrome, $12 sale. (*Psychol. Abstr.*, 1941, **15**, #4073.)

179. McGraw, M. B. Reflex swimming movements in the newborn of different species. New York: Warden & Gilbert Films, Columbia Univ., 1939. 100 ft., silent, monochrome, $8.00 sale.

180. McGraw, M. B. Suspension grasp behavior of the human infant. New York: Warden & Gilbert Films, Columbia Univ., 1939. 225 ft., silent, monochrome, $14 sale.

181. McGraw, M. B. Swimming behavior of the human infant. New York: Warden & Gilbert Films, Columbia Univ., 1939. 250 ft., silent, monochrome, $15 sale.

182. Maier, N. R. F. Abortive behavior as an alternative for the neurotic attack in the rat. Bethlehem, Pa.: Psychological Cinema Register, 1457 Main St., 1939. 320 ft., silent, monochrome, $16 sale. (*Psychol. Abstr.*, 1941, **15**, #1783.)

183. Maier, N. R. F. The intelligence of white rats. Bethlehem, Pa.: Psychological Cinema Register, 1457 Main St., 1933. 400 ft., silent, monochrome, $20 sale.

184. Maier, N. R. F., & Glaser, N. M. Experimentally produced neurotic behavior in the rat. Bethlehem, Pa.: Psychological Cinema Register, 1457

Main St., 1938. 600 ft., silent, monochrome, $30 sale. (*Psychol. Abstr.*, 1939, **13**, #2001. MAIER, N. R. F. Studies of abnormal behavior of the rat. New York: Harper, 1939.)

185. MAIER, N. R. F., & SACKS, J. Metrazol induced convulsions in normal and "neurotic" rats. Bethlehem, Pa.: Psychological Cinema Register, 1457 Main St., 1940. 360 ft., silent, monochrome, $18 sale.

186. MARCH OF TIME. Movies march on. New York: Museum of Modern Art Film Library, 11 W. 53rd St., 1940. 1000 ft., sound, monochrome, rental and sale prices on request.

187. MARTINI, M. United action. New York: Brandon Films, 1600 Broadway, 1939. 1200 ft., sound, monochrome, rental price on request.

188. MARVIN, D. Modern motherhood. Woodside, N. Y.: D. Marvin, 30–31 Hobart St., 1938. 400 ft., silent, monochrome, sale price on request.

189. MASSERMAN, J. H. The effects of ethyl alcohol on the motor cortex and the hypothalamus of the cat. Bethlehem, Pa.: Psychological Cinema Register, 1457 Main St., 1939–1940. 90 ft., silent, monochrome, $4.50 sale.

190. MASSERMAN, J. H. The effects of pentamethylenetetrazol (metrazol) on the functions of the hypothalamus in the cat. Bethlehem, Pa.: Psychological Cinema Register, 1457 Main St., 1939. 100 ft., silent, monochrome, $5.00 sale.

191. MASSERMAN, J. H. The effects of picrotoxin on the functions of the hypothalamus of the cat. Chicago: Division of Psychiatry and the Otho S. A. Sprague Institute, Univ. Chicago, 1938. 300 ft., silent, color, sale price on request. (*Psychol. Abstr.*, 1939, **13**, #1216. MASSERMAN, J. H. Effects of analeptic drugs on the hypothalamus of the cat. *Res. Publ. Ass. nerv. ment. Dis.*, 1940, **20**, 624–634.)

192. MASSERMAN, J. H. The functions of the hypothalamus in the cat: destruction experiments. Bethlehem, Pa.: Psychological Cinema Register, 1457 Main St., 1937–1940. 290 ft., silent, monochrome, $14.50 sale. (MASSERMAN, J. H. Destruction of the hypothalamus in cats. *Arch. Neurol. Psychiat.*, 1938, **39**, 1250–1271.)

193. MASSERMAN, J. H. The functions of the hypothalamus in the cat: the effect of electrical stimulation. Bethlehem, Pa.: Psychological Cinema Register, 1457 Main St., 1937–1940. 250 ft., silent, monochrome, $12.50 sale.

194. MASSERMAN, J. H. The reaction of the heart to faradic stimulation of the hypothalamus. Bethlehem, Pa.: Psychological Cinema Register, 1457 Main St., 1939. 60 ft., silent, color, $9.00 sale.

195. MASSERMAN, J. H. The role of the hypothalamus in emotion and experimental neurosis. 1. Conditioned feeding behavior in the cat. Bethlehem, Pa.: Psychological Cinema Register, 1457 Main St., 1938–1941. 200 ft., silent, monochrome, $10 sale.

196. MASSERMAN, J. H. The role of the hypothalamus in emotion and experimental neurosis. 2. The production of experimental neuroses in cats. Bethlehem, Pa.: Psychological Cinema Register, 1457 Main St., 1938–1941. 450 ft., silent, monochrome, $22.50 sale.

197. MASSERMAN, J. H. The role of the hypothalamus in emotion and experimental neurosis. 3. The role of the hypothalamus in conditioned feeding behavior. Bethlehem, Pa.: Psychological Cinema Register, 1457 Main St., 1938–1941. 140 ft., silent, monochrome, $7.00 sale.

198. Masserman, J. H. The role of the hypothalamus in emotion and experimental neurosis. 4. Direct hypothalamic conditioning. Bethlehem, Pa.: Psychological Cinema Register, 1457 Main St., 1939. 400 ft., silent, monochrome, $20 sale.
199. Masserman, J. H. The stimulant effects of dilute ethyl alcohol on the cruciate cortex of the cat. Bethlehem, Pa.: Psychological Cinema Register, 1457 Main St., 1939. 120 ft., silent, monochrome, $6.00 sale.
200. Metfessel, M. Song-isolated roller canaries. Los Angeles: Department of Psychology, Univ. Southern California, 1939. 400 ft., sound, monochrome, sale price on request.
201. Mitrano, A. J. The differentiation of aphasia from mental deficiency in children. Yonkers, N. Y.: A. J. Mitrano, 15 Glenbrook Ave., Park Hill, 1938. 350 ft., silent, monochrome, $40 sale.
202. Mowrer, O. H. Animal studies in the social modification of organically motivated behavior. Bethlehem, Pa.: Psychological Cinema Register, 1457 Main St., 1937–1938. 260 ft., silent, monochrome, $13 sale.
203. Mowrer, O. H. An experimentally produced "social problem" in rats. Bethlehem, Pa.: Psychological Cinema Register, 1457 Main St., 1939. 250 ft., silent, monochrome, $12 sale.
204. Mowrer, O. H., Kornreich, J. S., & Yoffe, I. Competition and dominance in rats. Bethlehem, Pa.: Psychological Cinema Register, 1457 Main St., 1940. 280 ft., silent, monochrome, $14 sale.
205. Neff, W. D., Smith, K. U., & Kappauf, W. E. The technique of brain surgery on the cat with observations on vestibular disfunction after sectioning the eighth nerve. Bethlehem, Pa.: Psychological Cinema Register, 1457 Main St., 1939. 320 ft., silent, monochrome, $16 sale.
206. Neibuhr, W. Machine: master or slave. New York: New York Univ. Film Library, 1941. 600 ft., sound, monochrome, $3.00 rental.
207. Page, J. D. Symptoms in schizophrenia. Bethlehem, Pa.: Psychological Cinema Register, 1457 Main St., 1938. 400 ft., silent, monochrome, $20 sale. (*Psychol. Abstr.*, 1941, **15**, #1796.)
208. Page, J. D. The treatment of mental disorders. Bethlehem, Pa.: Psychological Cinema Register, 1457 Main St., 1939. 400 ft., silent, monochrome, $20 sale. (*Psychol. Abstr.*, 1941, **15**, #1797.)
209. Pavlov, I. V. The nervous system. New York: Brandon Films, 1600 Broadway, 1937. 4000 ft., silent, monochrome, $280 sale, $28 rental, or $30 sale, $2.00 rental for each of 14 reels.
210. Rossman, M. Huntington's chorea. Bethlehem, Pa.: Psychological Cinema Register, 1457 Main St., 1939. 240 ft., silent, monochrome, $12 sale.
211. Sarnoff, J. Dissection of the brain. Brooklyn: J. Sarnoff, 1406 Albemarle Rd., 1937. 250 ft., silent, monochrome, sale price on request.
212. Schneirla, T. C. The behavior pattern of Central American army ants. Bethlehem, Pa.: Psychological Cinema Register, 1457 Main St., 1939. 650 ft., silent, monochrome, $30 sale. (*Psychol. Abstr.*, 1939, **13**, #5647.)
213. Smith, K. U. The acquisition of the token-reward habit in the cat. Bethlehem, Pa.: Psychological Cinema Register, 1457 Main St., 1937. 400 ft., silent, $20 sale. (Smith, M. F. The development and the extinction of the token-reward habit in the cat. *J. gen. Psychol.*, 1939, **20**, 475–486; *Psychol. Abstr.*, 1941, **15**, #1663.)

214. SMITH, K. U. Behavior disturbances after bilateral removal of the frontal areas of the cortex in cats. Bethlehem, Pa.: Psychological Cinema Register, 1457 Main St., 1938. 350 ft., silent, monochrome, $17.50 sale.

215. SMITH, K. U., & CARMICHAEL, L. Post-operative disturbances of visually controlled behavior in the cat following complete bilateral removal of the visual cortex. Bethlehem, Pa.: Psychological Cinema Register, 1457 Main St., 1935. 300 ft., silent, monochrome, $16.50 sale. (SMITH, K. U. The post-operative effects of removal of the striate cortex upon certain unlearned visually controlled reactions in the cat. *J. genet. Psychol.*, 1937, **50**, 137–156; Visual discrimination in the cat: V. The post-operative effects of removal of the striate cortex upon intensity discrimination. *J. genet. Psychol.*, 1937, **51**, 329–369.)

216. SMITH, K. U., & KAPPAUF, W. An analysis of the forms of animal learning: 1 & 2. Bethlehem, Pa.: Psychological Cinema Register, 1457 Main St., 1940. 380 ft., silent, monochrome, $19 sale.

217. SMITH, K. U., & KAPPAUF, W. An analysis of the forms of animal learning: 3 & 4. Bethlehem, Pa.: Psychological Cinema Register, 1457 Main St., 1940. 300 ft., silent, monochrome, $15 sale.

218. SPACE, K. F. Common mistakes and how to correct them. New York: Harmon Foundation, 140 Nassau St., 1939. 400 ft., silent, monochrome, $30 sale, $2.00 rental.

219. SPACE, K. F. Exposure and exposure meters. New York: Harmon Foundation, 140 Nassau St., 1939. 400 ft., silent, monochrome, $30 sale, $2.00 rental.

220. SPACE, K. F. Film editing. New York: Harmon Foundation, 140 Nassau St., 1939. 400 ft., silent, monochrome, $30 sale, $2.00 rental.

221. SPACE, K. F. How to use filters. New York: Harmon Foundation, 140 Nassau St., 1940. 400 ft., silent, monochrome, $30 sale, $1.50 rental.

222. SPACE, K. F. How to use your camera. New York: Harmon Foundation, 140 Nassau St., 1939. 360 ft., silent, monochrome, $30 sale, $2.00 rental.

223. STODDARD, G. D. Preschool adventures. Iowa City: Department of Visual Instruction, State Univ. Iowa, 1941. 1500 ft., silent, color, $125 sale; monochrome, $75 sale, $3.00 rental.

224. STRANDSKOV, H. H. Heredity. Long Island City, N. Y.: Erpi Classroom Films, 1939. 360 ft., sound, monochrome, $40 sale. (*Psychol. Abstr.*, 1941, **15**, #1705.)

225. STRANDSKOV, H. H. Reproduction among mammals. Long Island City, N. Y.: Erpi Classroom Films, 1937. 400 ft., sound, monochrome, $40 sale.

226. STRAUSS, A., & WERNER, H. Deficiency in finger schema (agnosia and acalculia). Bethlehem, Pa.: Psychological Cinema Register, 1457 Main St., 1939. 320 ft., silent, monochrome, $16 sale.

227. THORNBURGH, A. The realm of the honey bee. Washington: U. S. Department of Agriculture, 1935. 1600 ft., silent, monochrome, sale price on request.

228. TOLLEFSON, D. C., & MCNEILLE, L. B. Around the clock with you and your baby. Los Angeles: D. G. Tollefson, 511 S. Bonnie Brae St., 1941. 400 ft., silent, monochrome, free loan.

229. TOLMAN, E. C. Vicarious trial and error (VTE). Berkeley: Department of

Psychology, Univ. California, 1937. 100 ft., silent, monochrome, sale price on request.

230. Tolman, E. C., & Crannell, C. W. An animated cartoon of the schematic sowbug. Berkeley: Department of Psychology, Univ. California, 1938. 175 ft., silent, monochrome, free loan.

231. Twogood, A. P. Automobile service. Des Moines, Ia.: Vocational Guidance Films, 1940. 400 ft., sound, monochrome, sale price on request.

232. Twogood, A. P. Finding your life work. Des Moines, Ia.: Vocational Guidance Films, 1940. 400 ft., sound, monochrome, sale price on request.

233. Twogood, A. P. Journalism. Des Moines, Ia.: Vocational Guidance Films, 1939. 400 ft., sound, monochrome, sale price on request.

234. Twogood, A. P. Radio and television. Des Moines, Ia.: Vocational Guidance Films, 1939. 400 ft., sound, monochrome, sale price on request.

235. Twogood, A. P. The woodworker. Des Moines, Ia.: Vocational Guidance Films, 1940. 400 ft., sound, monochrome, sale price on request.

236. Van Dyke, W. Valley town. New York: New York Univ. Film Library, 71 Washington Square, 1941. 1000 ft., sound, monochrome, $4.00 rental.

237. Van Dyke, W., & Barlow, R. Design for education. New York: Sarah Lawrence College, 1939. 700 ft., silent, monochrome, rental price on request.

238. Van Dyke, W., & Pollard, S. The children must learn. New York: New York Univ. Film Library, 71 Washington Square, 1940. 500 ft., sound, monochrome, $3.00 rental.

239. Warden, C. J. Problem solving in monkeys. New York: Warden & Gilbert Films, Columbia Univ., 1938. 420 ft., silent, monochrome, $25 sale. (*Psychol. Abstr.*, 1939, **13**, #1340.)

240. Warden, C. J., & Gilbert, G. M. Testing animal intelligence. New York: Warden & Gilbert Films, Columbia Univ., 1939. 460 ft., silent, monochrome, $28 sale. (*Psychol. Abstr.*, 1940, **14**, #241.)

241. Warden, C. J., & Jackson, T. A. Development of behavior of the white rat. New York: Warden & Gilbert Films, Columbia Univ., 1938. 210 ft., silent, $13 sale. (*Psychol. Abstr.*, 1939, **13**, #1341.)

242. Weinstein, B. Color-categorizing behavior by monkeys. Glenview, Ill.: Coronet Productions, Inc., 1941. 400 ft., sound, color, $65 sale. (Weinstein, B. Matching-from-sample by rhesus monkeys and by children. *J. comp. Psychol.*, 1941, **31**, 195–213; Color-categorizing behavior in monkeys. *Psychol. Bull.*, 1941, **38**, 612–613.)

243. Werner, H. Analysis of visuomotor performance by a new marble board test. Northville, Mich.: Wayne County Training School, 1940. 400 ft., silent, monochrome, sale price on request.

244. Williamson, E. G., & Hahn, M. E. Aptitudes and occupations. Glenview, Ill.: Coronet Productions, Inc., 1941. 600 ft., sound, monochrome, $60 sale.

245. Woodard, S., & Woodard, H. Deadly females. New York: W. O. Gutlohn, 35 W. 45th St., 1936. 360 ft., sound, monochrome, $50 sale, $1.50 rental.

246. Woodard, S., & Woodard, H. Hermits of crabland. New York: W. O. Gutlohn, 35 W. 45th St., 1936. 400 ft., sound, monochrome, $50 sale, $1.50 rental.

247. Woodard, S., & Woodard, H. Living jewels. New York: W. O. Gutlohn, 35 W. 45th St., 1936. 400 ft., sound, monochrome, $50 sale, $1.50 rental.

248. Woodard, S., & Woodard, H. Neptune's mysteries. New York: W. O. Gutlohn, 35 W. 45th St., 1936. 400 ft., monochrome, $50 sale, $1.50 rental.

249. Woodard, S., & Woodard, H. Underground farmers. New York: W. O. Gutlohn, 35 W. 45th St., 1936. 400 ft., sound, monochrome, $50 sale, $1.50 rental.

250. Wunder, C. The seeing eye. New York: Skibo Productions, 1270 Sixth Ave., 1938. 400 ft., sound, monochrome, $30 sale.

251. Young, P. T. Technique for the study of food preferences of the white rat. Urbana: Department of Psychology, Univ. Illinois, 1937. 150 ft., silent, monochrome, $7.50 sale.

Film Sources and Literature

252. American Council on Education. Films on war and American policy. Washington: Publications Division, 744 Jackson Place, 1940. $0.50.

253. Anon. Three dimensional projection. *Leica*, 1938, **7**, 6–7, 20, 22.

254. Association of Documentary Film Producers. Living films. New York: Association of Documentary Film Producers, Inc., 56 W. 45th St., 1940. $0.50.

255. Association of School Film Libraries. Annual catalog. New York: Association of School Film Libraries, Inc., 9 Rockefeller Plaza, 1941. $5.00 (which includes Association membership).

256. Association of School Film Libraries. March of time (16-mm. versions). New York: Association of School Film Libraries, Inc., 9 Rockefeller Plaza, 1939. $5.00 (which includes Association membership).

257. Beck, L. F. A review of sixteen-millimeter films in psychology and allied sciences. *Psychol. Bull.*, 1938, **35**, 127–169.

258. Bell & Howell. Catalog of filmsound library. Chicago: 1801–15 Larchmont Ave., 1940. $0.25.

259. Bell & Howell. Medical and dental films. Chicago: 1801–15 Larchmont Ave., 1939. $0.50.

260. Brandon Films. The blue list. New York: 1600 Broadway, 1941. Free.

261. British Film Institute. The monthly film bulletin. London: 4 Great Russel St., 1940. 7s.6d.

262. College Film Center. Catalog of classroom films. Chicago: 59 E. Van Buren St., 1941. Free.

263. Cook, D. E., & Rahbek-Smith, E. C. Educational film catalog. New York: H. W. Wilson Co., 1941. $2.00.

264. Dale, E., & Tyler, I. K. The news letter. Columbus: Bureau of Educational Research, Ohio State Univ., 1941. Free.

265. Educational Screen. 1000 and one, the blue book of non-theatrical films. Chicago: 64 E. Lake St., 1940–1941. $0.75.

266. Films, Inc. Films of distinction. New York: Films, Inc., 330 W. 42nd St., 1941. Free.

267. Ford, A. The psychological cinema register. Bethlehem, Pa.: 1457 Main St., 1941. Free.

268. Gutlohn, W. O. Education films. New York: 35 W. 45th St., 1940. Free.

269. Land, E. H. Vectographs. Images in terms of vectorial inequality and their application in three-dimensional representation. *J. opt. Soc. Amer.*, 1940, **30**, 230–238.

270. Museum of Modern Art. Film bulletin. New York: 11 W. 53rd St., 1940. Free.

271. Progressive Education Association. The human relations series of films. New York: Commission of Human Relations, Progressive Education Association, 71 Washington Square South, 1940. $0.25.

272. Society for Visual Education, Inc. Chicago: 100 E. Ohio St.

273. Stone, C. H., Valentine, W. L., & Miles, W. The production of 16-mm. motion picture films. *Psychol. Bull.*, 1940, 37, 29–59.

274. Teaching Film Custodians. Catalog of films for classroom use. New York: 25 W. 43rd St., 1940. $0.50.

275. Three Dimension Corporation. New Holstein, Wisconsin.

276. Warden, C. J., & Gilbert, G. M. Instructional films in psychology. New York: Department of Psychology, Columbia Univ., 1941.

277. Wehberg, H. Culture groups in American life: a film survey. New York: Metropolitan Motion Picture Council, 100 Washington Square East, 1939. $0.25.

278. Wehberg, H. Films of everyday life. New York: Metropolitan Motion Picture Council, 100 Washington Square East, 1938. $2.00.

BOOK REVIEWS

PINTNER, R., EISENSON, J., & STANTON, M. The psychology of the physically handicapped. New York: Crofts, 1941. Pp. vii+391.

An evaluation of this book is to be made with a clear recognition of the fact that it is designed as an introductory textbook covering a relatively undefined and undeveloped field. The authors could not assume any very considerable sophistication on the part of many of their readers. As a result, they have produced a book which may be summarized by substituting "physically handicapped" for "blind" in Dr. Pintner's concluding remarks in his chapter on the blind:

> From this summary we can see that a good beginning has been made in the psychology of the blind. More knowledge and more accurate knowledge as to the capacities, abilities, and personality traits of the blind will help us to understand them better and to educate them better.

The relative lack of sophistication on the part of their prospective readers served, perhaps, as a source quite as much of relief as of perplexity to the authors.

A basic aspect of the authors' point of view is expressed in the preface in these words: "In one sense there is no special psychology of the physically handicapped individual as contrasted with the individual without any serious physical impairment. The same psychological mechanisms are at work in all cases." In other words, the physically handicapped are just as mysterious as other people. Accordingly, the first three chapters by Dr. Eisenson are given over to a general discussion of personality development, mental hygiene, and the internal mechanisms of behavior. For students with adequate background in the areas covered, these chapters are probably not essential; for other students, the material presented might well be liberally extended, particularly by way of including additional discussion of remedial principles and procedures. One gets the impression that these chapters are intended as orientational, but, as the rest of the book makes abundantly clear, they deal with problems that are actually in the foreground of the psychology of the physically handicapped. As a matter of fact, if the book may be said to have a major shortcoming, it lies in the absence of a relatively thorough treatment of the problem of personality adjustment, particularly from the remedial or re-educational standpoint, a problem more important, perhaps, than any other from the point of view of the handicapped individual himself.

Another and closely related point that should be mentioned is the fact that these authors, like practically all others in the same field, neglect the point of view of the parents of the handicapped child. If anyone is looking for a gravely needed unwritten book, it is one which will treat as adequately as possible the almost unnervingly persistent problems which certain types of physically exceptional children unwittingly create for their distraught parents, and which must be dealt with in the home. The

prospective teacher of the handicapped could well be prepared to help parents in meeting some of these problems.

Dr. Pintner's survey of available psychological tests that have been designed or adapted for use with particular handicapped groups is very informative and meets a pressing need, since many of the standard measuring instruments are quite inappropriate for use with the blind, deaf, crippled, certain speech defectives, etc. In four other chapters Dr. Pintner summarizes clearly and comprehensively the studies that have been done on the intelligence, educational achievement, vocational and social adjustment, and personality characteristics of the deaf, hard of hearing, blind, and partially seeing.

The crippled and such other groups as the malnourished, epileptic, encephalitic, diabetic, allergic, cardiopathic, and tuberculous are discussed by Dr. Stanton. The need for a great deal of further research in these areas is made especially apparent.

Dr. Eisenson's discussion of speech defectives in the last two chapters is limited almost entirely "to speech disturbances which are known or thought to have organic bases." Readers who are not careful or previously informed may get the erroneous impression from these chapters that nearly all speech defects are organically determined. This reviewer was particularly struck in this connection by the discussion of stuttering, in which only theories positing "special organic conditions" (those of Travis, West, and Eisenson, respectively) are presented! This is in keeping with the design of the book as a whole, of course, but it might well give many readers an impressively distorted point of view with regard to stuttering. Moreover, with regard to stuttering, it so happens that a very large number of research investigations have been made and several hundred published references are available, of which only nineteen are listed—and none of these is from the *Journal of Speech Disorders*, in which most of the studies of stuttering have been published since 1936. This particular section of the book definitely needs to be supplemented by the addition of much more factual data, as well as a more rigorous theoretical treatment of the problem.

As a survey, on an elementary level, of a tremendously vast field, this book will serve quite well the needs of many students. Most of the bibliographies, one at the end of each chapter, are sufficiently representative to direct the student into a balanced program of supplementary reading. It is a book, however, which most instructors would want to use as primarily an outline for a course—as the menu rather than the *pièce de résistance*.

WENDELL JOHNSON.

University of Iowa.

BOOKS AND MATERIALS RECEIVED

Brennan, R. E. Thomistic psychology: a philosophic analysis of the nature of man. New York: Macmillan, 1941. Pp. xxvi+401.

Buros, O. K. (Ed.) The second yearbook of research and statistical methodology. Highland Park, N. J.: Gryphon Press, 1941. Pp. xx+383.

Gard, H. V. Infinite man. Boston: Bruce Humphries, 1941. Pp. 291.

Germane, C. E., & Germane, E. G. Personnel work in high school: a program for the guidance of youth—educational, social, and vocational. New York: Silver Burdett, 1941. Pp. xv+599 +index.

Jones, D. M. The Keystone method of teaching reading: an adaptation of lantern slides and the stereopticon to the teaching of reading in Grade One. Meadville, Pa.: Keystone View, 1941. Pp. ix+136.

Penfield, W., & Erickson, T. C. (with Chap. XIV by H. H. Jasper and Chap. XX by M. R. Harrower-Erickson). Epilepsy and cerebral localization: a study of the mechanism, treatment and prevention of epileptic seizures. Springfield, Ill.: Thomas, 1941. Pp. x+623.

Robinson, F. P. Diagnostic and remedial techniques for effective study. New York: Harper, 1941. Pp. ix+318.

Ruch, F. L., Mackenzie, G. N., & McClean, M. People are important. Chicago: Scott, Foresman, 1941. Pp. xii+283.

Street, R. F. Children in a world of conflict. Boston: Christopher, 1941. Pp. 304.

Todd, J. E. Social norms and the behavior of college students. *Teach. Coll. Contr. Educ.*, No. 833. New York: Bureau of Publications, Teachers College, Columbia Univ., 1941. Pp. ix+190.

NOTES AND NEWS

DR. PETER SANDIFORD, professor of educational psychology and director of educational research in the College of Education, University of Toronto, died on October 12, 1941, at the age of 60.

IN memory of James Hervey Hyslop and Walter Franklin Prince, the AMERICAN SOCIETY FOR PSYCHICAL RESEARCH has established a FELLOWSHIP of $1250, to be awarded to a postdoctoral or predoctoral student of psychology. In the case of applicants who have not received the Ph.D. degree, the completion of all work other than the dissertation is required.

The Fellowship is designed to make possible the intensive investigation of a problem in parapsychology and to acquaint the Fellow at first hand with the nature of the research field. An original research project should be submitted at the time of application. A research fund of $250 will be available to the Fellow in addition to his stipend. The Fellowship year must be spent in New York City.

In order to permit the candidate to carry on study and research in other fields, the Fellowship is defined as involving two-thirds time; the other one-third can be given either to physiological or to social psychology.

The Fellowship will be awarded on the basis of (1) the research program submitted; (2) a competitive examination emphasizing general experimental psychology, the psychology of personality, abnormal and clinical psychology, physiological psychology, and statistics; (3) an examination in psychical research upon the following: Coover, J. E. *Experiments in psychical research at Leland Stanford University*; Gurney, E., Podmore, F., & Myers, F. *Phantasms of the living* (2 Vols.); *Journal of Parapsychology* (Vols. I–V); Kennedy, J. L. *Psychological Bulletin*, 1939, **36**, 59–103; Pratt, J. G., Rhine, J. B., Smith, B. M., Stuart, C. E., & Greenwood, J. *Extra-sensory perception after sixty years*; (4) a personal interview with the Research Committee.

The closing date for receipt of applications will be January 31, 1942. Applicants will shortly thereafter be consulted about convenient times and places for the examination and the interview. In case the applicant's residence is too far from New York to make a personal interview feasible, the Research Committee will accept the report of any experimental psychologist acquainted with the applicant and capable of evaluating the likelihood of his doing an effective piece of research. The award will be made on March 1, 1942.

The Fellowship is to be administered by a Committee of the American Society for Psychical Research, consisting of Dr. George H. Hyslop, 129 East 69th Street, New York City; Dr. Edwin G. Zabriskie, Neurological Institute, Fort Washington Avenue and 168th Street, New York City; Dr. Gardner Murphy, Chairman of the Committee, The College of the City of New York, 139th Street and Convent Avenue, New York City. More details can be obtained by writing to the Chairman of the Committee.

THE WASHINGTON-BALTIMORE BRANCH of the American Psychological Association held the first meeting of the academic year 1941–1942 at Wilson Teachers College, Washington, D. C., on October 30, 1941. Papers were presented by: Dr. Steuart Henderson Britt, George Washington University; Dr. Jerome S. Bruner, Federal Communications Commission; and Mr. Luigi Petrullo, Social Security Board.

THE Nineteenth Annual Meeting of the AMERICAN ORTHOPSYCHIATRIC ASSOCIATION, an organization for the study and treatment of behavior and its disorders, will be held at the Hotel Statler, Detroit, Michigan, on February 19, 20, and 21, 1942. Copies of the preliminary program may be obtained from Dr. Helen P. Langner, Vassar College, Poughkeepsie, New York. A registration fee will be charged for nonmembers.

THE one-hundredth anniversary of the opening of the COLLEGE OF LITERATURE, SCIENCE, AND THE ARTS OF THE UNIVERSITY OF MICHIGAN was celebrated at Ann Arbor on October 15, 1941. The various achievements of the College in language and literature, science, and the social sciences, and other features of the development of the College were discussed at a morning session, while the afternoon session was devoted to a discussion of the problems and future of liberal arts education in the United States. Luncheon and dinner programs were also held. The celebration was concluded with a Convocation in the evening which was addressed by Dr. James Rowland Angell, President-emeritus of Yale University and educational counsellor of the National Broadcasting Company. Dr. Angell is an alumnus of the University and the son of a former President of the University.

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